SCIENTIFIC AMERICAN

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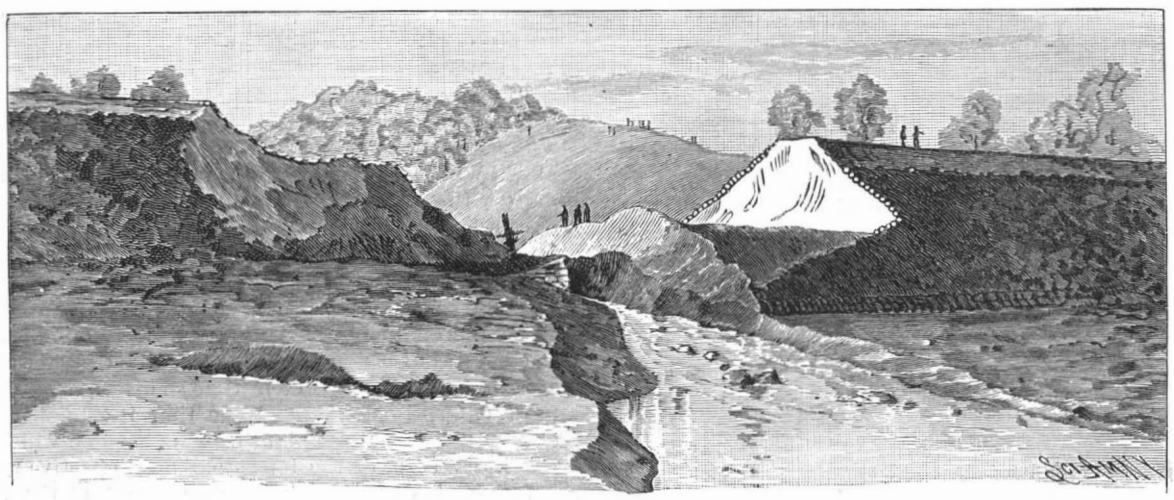
COLLAPSE OF THE SOUTH FORK DAM AND DESTRUCTION OF JOHNSTOWN.

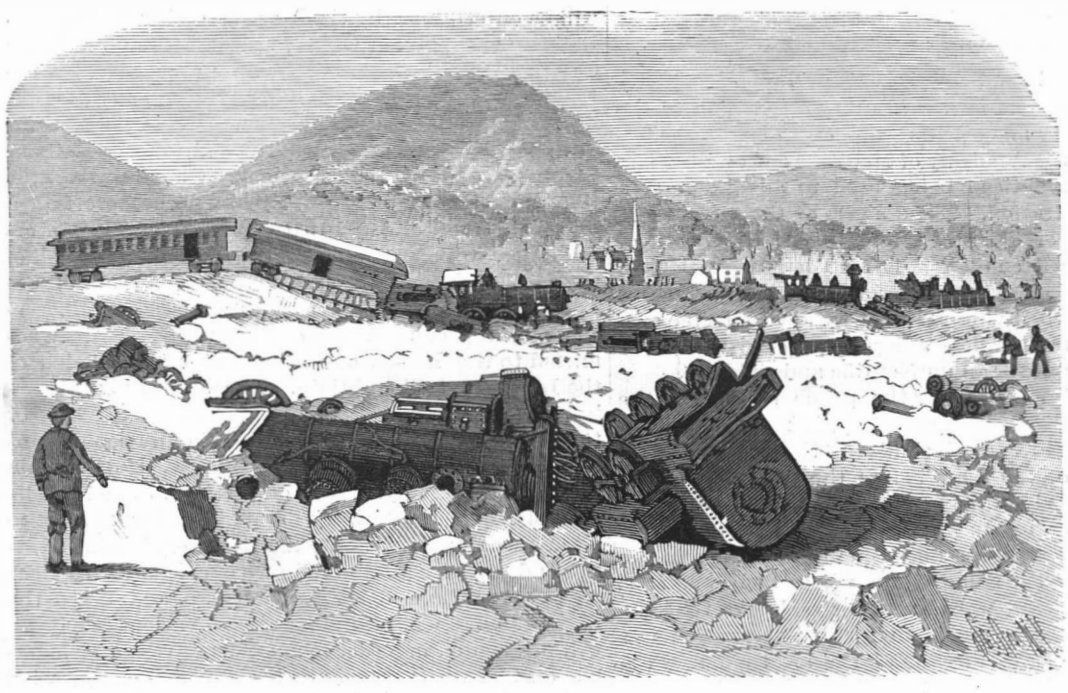
The general features of the fatal disaster at Johnstown, Pa., due to the failure of the South Fork dam, by which, in a couple of hours, so many thousand lives were lost, were given in our last issue. It was due to a very severe storm, which had overtaxed the capacity of the dam. We give in this paper a number of illustrations of the localities affected, which will serve to make still clearer the ultimate and proximate causes of the disaster. The South Fork lake is now extinct; the great crevasse in the dam gives passage to an insignificant stream of water that, before reaching it, winds through what was once the bottom of the lake. Well up on the sides of the valley once filled with the waters of the lake are the cottages and club house of the South Fork Hunting and Fishing Club. Before the disaster, Mr. John G. Parke, Jr., a civil engineer, was directing some work upon a drainage system designed to carry the refuse water away from these houses to the lower side of the dam, in order to prevent the contamination of the water. He had found the water rapidly rising, and went up toward the upper end of the lake. There he found the woods "boiling full of water," as he expressed it. An attempt was made to strengthen the dam by running a plow along its top and throwing earth in against its face. As the rise continued, a gang of men were set to work, and a cut about twenty feet wide and three feet deep was excavated on the west side, giving a spillway, through which a torrent of water escaped. At the other end of the dam the regular spillway, of considerably greater dimensions, was also discharging water. Still the lake rose, and at 11:30 a. m. Mr. Parke gave up hope of averting an overflow. He galloped down to South Fork, and sent men off to the telegraph office with warnings for Johnstown and the other villages. At about one o'clock he reached the dam again, and walked over it. About three inches of water was upon it, pouring down the outer slope and gradually eating away the face. At three o'clock the break began, a piece ten feet in width near the center first succumbing. In three-quarters of an hour the base of the dam was reached, and the lake was empty.

Two of our views show the dam as it appeared a few days after the accident, viewed from the interior or lake side. Another view shows the lake as it appeared before the accident, with the spillway crossed by bridges. The dam was an embankment about eight hundred feet long and seventy-five feet high, with practically equal slopes on each side of about forty-five degrees. The top was

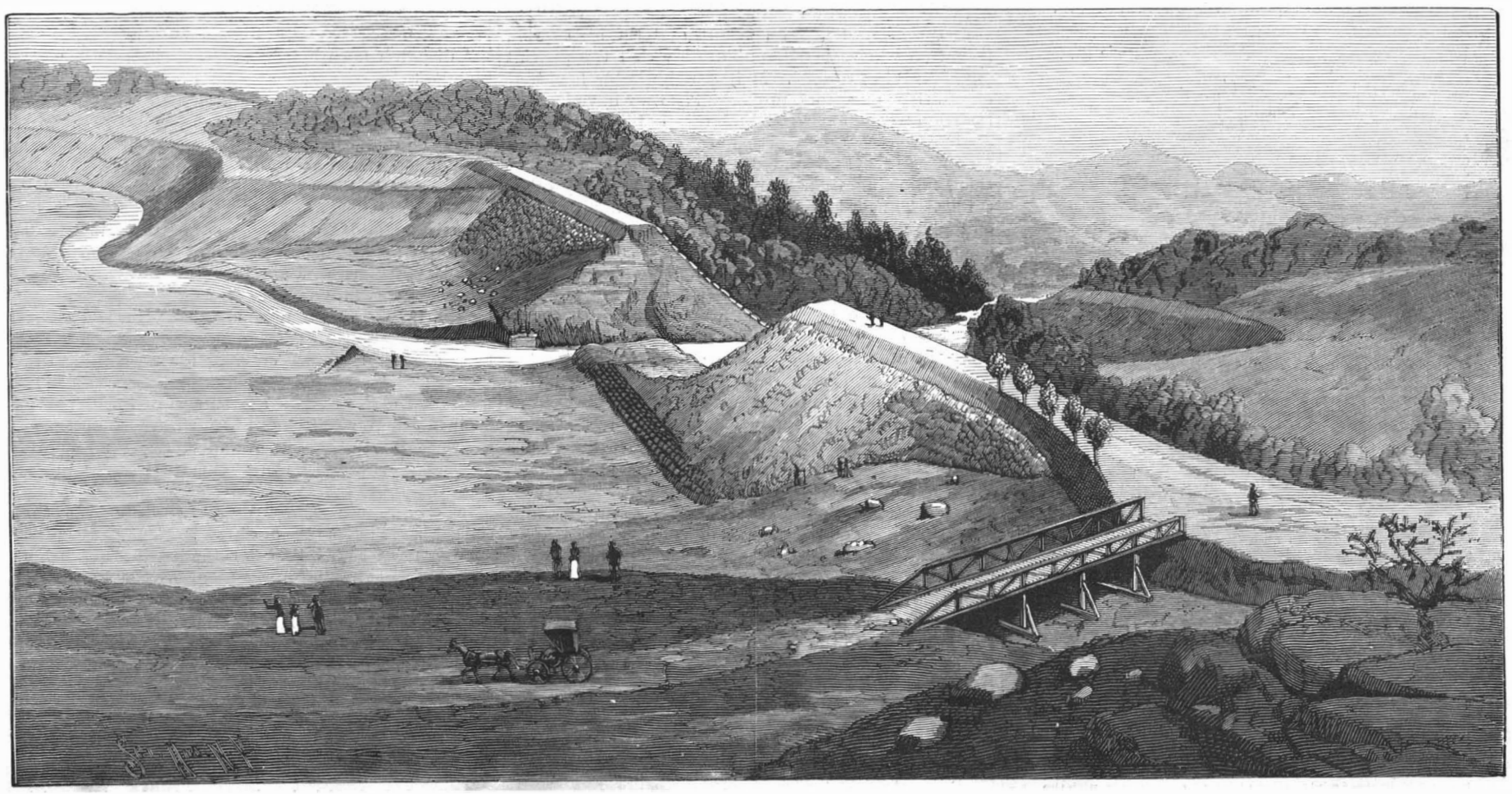
(*Continued on page* 390.)



VIEW OF THE INTERIOR OF THE DAM AFTER THE ACCIDENT.



BURIED LOCOMOTIVES AND WRECK OF CARS AT EAST CONEMAUGH.



PRESENT APPEARANCE OF SOUTH FORK DAM.—[From sketches made on the spot by special artist of SCI. AM.]

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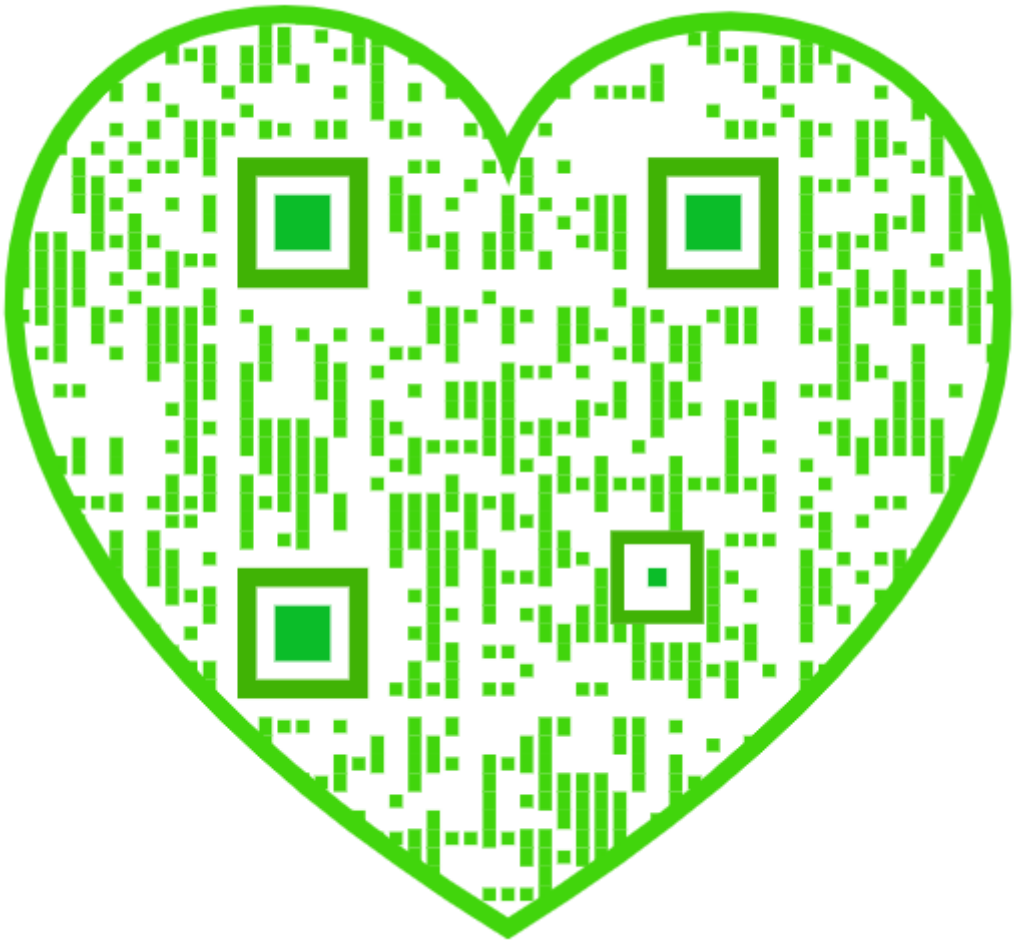

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AMERICAN AND ITALIAN WAR SHIPS.

No person in the United States having been found with ability sufficient to design and draw plans for fast and powerful war ships, the late Secretary of the Navy, Mr. Whitney, bought some plans of an Englishman, and for them paid a large sum.

These were substantial duplicates of the plans of a ship previously built in England, and on the lines so obtained the American cruiser Charleston has been built. In the meantime, and in fact in less time than it took our authorities to dicker for old drawings and copy a built ship, the Italian government ordered and has completed the construction of a new cruiser, on new plans, and the new vessel, although smaller than the Charleston, is superior in speed and power of armament. In fact, the velocity of the Piemonte surpasses our much-bragged-of torpedo boat Vesuvius. The latter made 21½ knots per hour; the Piemonte, 22 03 knots. The Charleston, 3,700 tons, it is hoped may reach 19 knots, but probably will not.

The much-vaunted prowess of our Vesuvius in being able, by her superior speed, to choose her position and destroy the strongest enemy at her leisure is knocked on the head. The new Italian ship can do this little job, not the American. Every one of the new ships built and those now being built by our government can be outsailed and probably overcome if attacked singly or in pairs by the Piemonte. It is humiliating to confess, but it must be admitted, the United States government is at the present time so utterly lacking in naval enterprise and knowledge that it cannot build, and cannot even order plans from abroad on which to build, new ships of the latest and most effective type.

We give in another column an account of the Piemonte as an example of the latest triumph in naval architecture, from which it is to be hoped our home authorities may derive useful instruction.

THE NEW MAUSOLEUM.

"The new system for the sanitary disposition of the dead in the new mausoleum" was explained in the lecture room of the Academy of Medicine one evening last week, the stereopticon being used to advantage as a means of illustration. The dangers of the present system of burial were pictured, and, indeed, if the half of what was urged against it is true, it is pernicious in the extreme, being, so it would appear, a menace to the health of the living, especially those of feeble constitution or temporarily ailing, a concession to false sentiment, a relic of an unscientific and rude age.

The "new" mausoleum, the prime feature of the project to supplant the cemetery, is not, in its more important features, at all similar to that erected more than three hundred years before the Christian era to receive the body of King Mausolus, and from which this system of mortuary structures takes its name. That was intended for one, as, curiously enough, the termination of the name of him whose body was thus originally disposed would signify; and save that the body was sealed in stone, no further precaution was taken against contamination of the air than now obtains in the ordinary vault.

The "new" mausoleum is designed to contain about 40,000 bodies, to preserve them, though dead, in fair semblance of what once they were, and, best of all, to save the ground and its waters, and the air as well, from that wholesale contamination which the present system is said to breed. It is a remarkable fact that our Puritan ancestors, proverbial as they have become for sound common sense and reasonable practices in all else, selected eminences, more especially hill-tops, for their graveyards and cemeteries, the later generations following their lead in this as in many other things. Thus it is that in New York we have Trinity churchyard on the top of a hill; even the newer Trinity cemetery on Washington Heights is on an elevation. Greenwood cemetery, in Brooklyn, is on the crown of a broad hill. Such situations, it is said, are the very worst that could be selected, when the health of the living is considered, because of the water soaking through the ground, there to gather contamination and disease and bear it downward for distribution among the habitations.

Desiccation, that is the principle of the new system, the fluids and gases of the body, constituting 70 per cent of its whole volume and the sole cause of putrefaction, being slowly but surely dissipated. The receptacles, arranged singly and in family groupings and chambers, have only two small openings each; one by which the artificially dried air may enter, and another to allow of communication with the furnace in the sub-cellar. The dry air, entering, charges itself instantly with the vaporized water and gases, passing through pipes to the furnace, being there purified by fire and then forced outside, with no evidences of corruption remaining in it.

As to the condition which constant currents of dry air induce, a photograph was exhibited of a pilgrim which some travelers had come upon among the arid mountain plains of the Himalayas. Apparently exhausted from lack of water, he had sunk down upon the ground, leaned against a rock, and died; his head thrown back, his mouth open. For many years, it is said, the body of the man had remained thus intact, unmistakable evidences of the fact being at hand. Yet, if the photograph is to be relied upon, there were no observable evidences of death save the stiffness of the pose, the flaccid give of the muscles.

In the "new" mausoleum the advanced scientific knowledge of the day will be utilized to its best; and judging from examples that have come down to us through the ages and similarly treated, intentionally or accidentally, there is reason to believe that the dead of the new mausoleum may readily be made to retain symmetry of feature and natural expression for centuries, and remain wholly inoffensive to sight or smell.

Included in the proposed plan is a system of delicate electrical wires, to be attached to the limbs, where any doubt remains as to the actual presence of death; the apertures of the receptacles being always open, suffocation cannot take place, and the slightest movement of the wires will serve to ring a bell in the watch room.

The Visit of American Engineers to London.

Our readers, says *The Ironmonger* of June 1, will learn with interest that a party, numbering probably 220, being members of American societies of civil, mining, mechanical, and electrical engineers, accompanied by 50 ladies, are expected to reach Liverpool on or about June 5, and London a week later, where they intend to remain together as a body for a few days. Local committees have been formed at Liverpool and at Manchester, where arrangements are in progress for the inspection of engineering works on the day, or days, that may be spent in those cities, and the Mayor of Liverpool has invited the whole party to a conversazione in the City Hall on the evening of Thursday, the 6th. On Friday, the 7th, members of the party will be entertained by the London and Northwestern Railway Company at Crewe, by the Midland Railway Company at Derby, and, in all probability, by the Lancaster and Yorkshire Railway Company at Horwich. The Whitsuntide recess will be spent in tours arranged by the London and Northwestern Railway Company and by Cook's agency. On Thursday, the 13th, the whole of the gentlemen will be entertained by the members of the Institution of Civil Engineers at dinner, which will take place in the Guildhall of the City of London, by the express sanction of the Lord Mayor, Aldermen, and Common Council. On the morning of the same day the visitors will be admitted to the Houses of Parliament by permission of the Lord Great Chamblain. Her Majesty the Queen has been graciously pleassd to allow the entire party to visit Windsor Castle and its surroundings on Saturday, June 15, and St. James's Palace, Buckingham Palace, and the Royal Mews on Monday, June 17. The Archbishop of Canterbury has acceded to a request to allow the members of the American enginering societies and their friends to be shown over Lambeth Palace on Tuesday, June 18. Excursions up and down the River Thames will be organized, and various privileges will be granted in order to render the visit a memorable one. The Institution of Civil Engineers, with their well known public spirit and hospitality, are actively exerting themselves in the matter.

Cave Dwellers Found in Mexico.

A dispatch from Deming, New Mexico, says: "Lieutenant Schwatka has arrived here. His party has been successful beyond expectations in their explorations, and especially in Southern Chihuahua, where living cliff and cave dwellers were found in great abundance, wild as any of the Mexican tribes at the time of Cortez's conquest. The abodes they live in are exactly similar to the old, abandoned cliff dwellings of Arizona and New Mexico, about which there has been much speculation. It was almost impossible to get near them, so wild and timid were they. Upon the approach of white people, they flee to their caves by notched sticks placed against the face of the cliffs, if steep, although they can ascend vertical stone faces if there are the slightest crevices for their fingers and toes.

"These cliff dwellers are sun worshipers, putting their new-born children out in the full rays of the sun the first day of their lives, and showing many other forms of devotion to the great luminary. They are usually tall, lean, and well-formed, their skin being a blackish red, much nearer the color of the negro than the copper-colored Indian of the United States.

"Schwatka claims that nothing has heretofore been known about these people, except by the half-Indian mountain Mexicans, and thinks his investigation will be of immense anthropological and archæological value. He estimates the cave and cliff dwellers to be from 3,000 to 12,000 in number, armed only with bows, arrows, and stone hatchets."

THE tinfoil so commonly used to wrap Neufchatel cheese, chewing gum, various kinds of candy, and all kinds of chewing tobacco, is said to be dangerous on account of the lead in it. Its use for wrapping articles of food has been forbidden in France.

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TIME SIGNALS BY THE MAGNESIUM LIGHT.

To the Editor of the Scientific American:

Having recently seen a magnesium flash light used for instantaneous photography, it occurred to me that the intense light produced could be utilized to advantage for distributing standard time signals by night. I decided to test the principle in a practical manner, and have obtained some very satisfactory results. The ordinary flash lamp, as made for photographic purposes, is an alcohol lamp giving a large flame through which a charge of magnesium powder is blown by means of a rubber bulb held in the hand. On pressing the bulb the magnesium is instantly ignited by being brought in contact with the alcohol flame. A lamp of this kind was fastened to a suitable frame, to which was attached a common telegraph sounder. A heavy weight was suspended over the bulb of the flash lamp in such a manner that it could be instantly released by the action of the sounder, thus depressing the bulb and firing the magnesium. The apparatus was connected with the signal circuit of the standard clock and a series of experiments was made. By previous arrangement the signals were observed by Mr. H. H. Clayton, of the Blue Hill Observatory, at a distance of twelve miles, and were seen with great distinctness. Rough observations showed that the time lost in the action of the firing mechanism was less than 0·4s. This error was nearly constant, and can be rendered practically inappreciable by properly constructed apparatus, specially designed for the purpose. The flash light would have the advantage of being visible to the unaided eye at a much greater distance than a time ball.

Being necessarily used in the evening, it would be seen by many whose only leisure time is after working hours. A flash signal fired from a hill or from the top of a high building would be visible in all directions for many miles. The cost of the apparatus is very small when compared with that of the time ball. I think that a system based on the principle which I have described will recommend itself to those interested in time service matters as cheap and effective.

WILLARD P. GERRISH.

Harvard College Observatory, June 8, 1889.

The Paris Exhibition.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

PARIS, June 1, 1889.

Some idea of the immensity of the Paris exhibition may be gathered from the fact that, notwithstanding the five days I have spent in the exhibition since it opened, I have not as yet come across the exhibits of agricultural machinery. At a rough guess I should say that to walk through the aisles straight ahead, without turning back, would involve a tramp of at least a dozen miles, and one of the difficulties is to know where to begin and where to leave off without missing items of importance. Resuming, however, my general survey of the principal buildings, one cannot fail to be struck with the amount of gilding apparent everywhere. The interiors of the domes of the buildings are ablaze with it, and to judge from the exhibits we may call this the gilt year. In the Austria-Hungary section of ceramics, glass, etc., which is one of the most charming and artistic sections of the whole exhibition, the gilt gives a distinguishing tone to the exhibits as a whole, the effect being soft and elegant. Refined beauty, indeed, seems to pervade this whole section, which casts all its competitors entirely into the shade, and makes the visitor feel dissatisfied with them. This effect is obtained without the vulgar glare that usually attends the employment of much gold, by means of the patterns, which are small and intricate, after the East Indian style. In the Belgian section, gold again predominates, the ground being white and sufficiently prominent to give a distinctly whitish character. The exhibits of the Pays Bas in this section are somewhat meager, and there is more vacant floor space than needs be. There are some excellent tapestries in the Belgian department, but in this part of the exhibition a good portion of the space is not yet opened to the public.

The Australian colonies have a fair exhibit, but not any better than they had at the centennial. We find here the usual models of huge gold nuggets and specimens of the fauna and flora of the colony, with some very fine photographs of the great trees, the largest of these photographs measuring about 4 feet by 2½ feet, and showing a tree 326 feet high. The quantity of statuary in the exhibition is very remarkable. Indeed, in one side of the quadrangle of the grounds inclosed by the main buildings and ending at the Eiffel tower, I counted 125 statues, a large proportion being in front and in the neighborhood of the refreshment rooms. A great many of these exhibits are in an unfinished state. Hence nothing can be said about them; but some of those that are apparently finished are sadly marred by faulty joints of arms, legs, etc., where those members are affixed to the main body. Those who have seen the Albert memorial in Hyde Park will remember to what a painful extent this same defect is apparent, and visitors to Paris will not fail to observe it upon seeing the beautiful groups of statuary in front of the Grand Opera House. Surely there is no great difficulty in remedying so demoralizing a blemish.

As one enters the hall of statuary in the Palais des Beaux Arts, the *coup d'œil* is very impressive indeed, and it is very difficult to define whence the impressiveness arises. No doubt the immense size of the hall with nothing but statuary in it has something to do with it, as also has its great height, but be the cause what it may, it is a majestic as well as a beautiful display. The galleries of this hall are not as yet opened to the public, nor indeed are there any exhibits in them, except it be some tapestries that hang against the wall. There are in this section about twenty tapestries (mostly of the last century and upon biblical subjects), and these will form very attractive objects to American visitors. In some cases plaster casts are doing service as representatives of masterpieces that could not be moved to the exhibition, a case in point being "La Jeunesse" by Antonin Cartes, the original being in the Luxembourg Museum. Among the prominent statuary, the following may be mentioned: A bronze group by A. Cain, of a life size rhinoceros and two tigers, the former having crashed his horn into the side of one of the tigers, which lies on its back with its claws helplessly distended, while the other is vainly trying to bite through the mail of the rhinoceros. This is an exceedingly effective and fine production, as is also another exhibit of the same artist, representing an alligator in the jaws of a lion.

There is a full size statue of Mons. Chevreul, that is very life like and natural, and a bust of Henry George hidden away in a corner. A plaster statue entitled "Berger and Sylvain," which belongs to the government, and was in the salon of 1884, is an artistic piece of work, but a bad joint in the muscle of the right arm is a prominent blemish. Some of the plaster models are very large, one I noticed being about 14 feet high and 8 feet wide. The subject is the return of veterans from the war. The main figures are two soldiers embracing each other amid a profusion and confusion of warlike implements, with two women drawing together with outstretched arms the folds of battle flags whose staffs are in the hands of some soldiers beneath; the size as well as the execution of this exhibit make it notable. Another exhibit, a woman mourning over a tomb, is very effective, and reminds one very forcibly of the bronze statue (of similar *motif*) in Woodlawn Cemetery, N. Y. "Moliere et sa Servante," from the salon of 1886, is also beautifully executed, but the sheet of paper Moliere holds in his extended hand is too small, so that the servant, instead of looking at it, is looking clear over it. The pen Moliere holds in his right hand is a veritable quill, coated with plaster, part of which has fallen off, exposing the quill—a defect which will doubtless be remedied in due course. There are several good representations of the "femme furieux" and of the "femme militaire."

A notable exhibit in this department is some tinted busts and statues by A. Wiezenberg, "Rome, 1889." Gibson's tinted Venus created, it will be remembered, quite a stir in the artistic world in 1862, at which date it was exhibited in the London Universal Exhibition. The effect of the tinting has been somewhat marred by a blue vein in the marble, running almost around one thigh. Wiezenberg's exhibits are, however, of a very clear, pure marble, and are in some cases so slightly tinted that the casual observer does not for the moment discover the tinting. The best specimen of this exhibit is a life size bust entitled Mapye A. She has a faintly tinted bandanna around her head, and around its edges are two fine gilt lines. Similar lines run around the collar of her bodice. Her eyes are very faintly tinted, giving them an exceedingly natural appearance, and one has to inspect very closely to discover the tinting. The execution of this exhibit is very charming, the face not perhaps so beautiful, but so expressive, natural, and warm, with an individuality that delights the beholder. Undoubtedly this will be a general favorite with the public at large.

The same artist exhibits a life size "Germania," in which the hair is plainly and the eyes slightly tinted, but the latter not all over, the term "shaded in parts" perhaps being a more correct one. A third example is "Ideal," in which the eyes are so plainly tinted that it gives the idea somewhat of an artistic trick. Her tiara is gilded, and the general effect of the whole is not altogether good. A fourth exhibit is "Reale," whose hair is very effectively tinted, and the eyes are good *at a distance*. The first named is by far the best, although only a bust, while the others are full figures.

Near this group, and one each side of the doorway, are two exhibits that are good in their way. Both are in terra cotta and by Holden Hertzberg. The best is a "Whistling Boy." The position in which he is placed is an exceedingly happy one, for, being close to the door, he looks as though he had just entered it, and was taking a general survey of the hall. He stands with both feet apart, his hands in his trousers pockets, his back bent slightly in, and the whole pose is of a happy-go-lucky yet contemplative style that is very taking. It is difficult to conceive that this is an artist's conception, because of the peculiar individuality of the face, which has a frank, trustworthy expression, combined with the acute intelligence that is more often found in the good street boy than in the good school boy.

A companion exhibit on the other side of the same doorway represents a boy with the two forefingers of his left hand in his vest pocket and his right hand in his trousers pocket, while his eyes are partly closed and looking sideways. As there is no title to this, I presume it is expected to tell its own story, but it does not. The attitude would interpret very well into "Can I afford to buy it?" or "Can I scrape together enough money to buy it?" but there is an acute cunning in the face, and the strained side look in the eyes would rather suggest (outside the position of the hands), "I'm a-watchin' of yer." The nose is sharp, the face somewhat lean, and the lips thin, giving an idea of general untrustworthiness. The beauty of the human form divine is marred in some few instances by defects in the coloring of the marble being so painfully marked that tinting the blue blotches would seem not only permissible, but decidedly necessary.

A very effective plaster model represents a large gorilla who has seized a female figure, and his right paw grips her from the upper rib, round under the arm, pressing deeply into the flesh. He is leaning forward in an attitude of defiance, ready to do battle for his prize, and to spring at an assailant who has shot an arrow through the flesh on his left side. The female is forcing herself from his embrace with all the life that is left in her, her hands being partly buried in the flesh of his neck. The strength and ferocity of the gorilla is beautifully portrayed in this work, around which a group of visitors is always found. The sculptor (E. Fremie) was awarded for it a medal of honor at the Paris salon. One more striking work of art may be noticed before concluding a cursory glance at this hall, and it is entitled Lutinerie. On a lion's skin reclines a nude nymph who has partly raised herself on one arm. Her right hand is extended, and has by the ear a young satyr, who has evidently been caught in the very act of trying to take her by surprise. The expression on both faces is admirable, the one saying, "Ah! I've just caught you, sir!" the other has two expressions, one showing that his ear is being pulled much harder than he cares to confess, and the other saying, "Let go! It's all right. I know you don't really mean it." The sculptor is Jean de Villeurs.

The exhibits of painting are arranged in rooms or *salles*, but no seats are as yet provided for them, and from the narrowness of the doorways, considerable crushing must inevitably occur on days when the attendance is large. Of course there are some fine pictures, a great many fine pictures, in fact, but there are also some that are otherwise, among which I should place a picture numbered 03 in salle No. 1. It is a female whose dress has an unnatural satiny gloss, and is dotted over with vertical splashes of many colored paints. Her face is covered with a remarkably pronounced yellow that could not possibly be produced naturally, nor indeed artificially by any ordinary means save by a *heavy* coating of yellow ocher. The splashiness of the dress leads one to suppose that this painting is one of that new order of which something has been heard in London lately, and of which it has been said that, if you look at the splashes long enough, it breaks on you like a revelation that a beautiful picture is emerging from them. I have not tried this prolonged gazing, as a short gaze is quite painful enough. In connection with pictures, one cannot altogether ignore the matter of picture frames. All very large picture frames are of gilt moulding, of course, but in the matter of smaller ones, say under three feet, I found more artistic frames and a greater variety in New York (on my visit last December) than I find here. This may, of course, be partly on account of the gilt craze (which exists not only in picture frames, but also in mirror frames and over mantels, in England), which does not seem to have extended to the United States.

JOSHUA ROSE.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Southern District of New York.

YOUNG *et al. v.* FOERSTER.

PATENT STONE SAWING MACHINE.

Cox, J.

A machine purchased of the complainant, the patentee, by the employer of the defendant, was repaired and its construction somewhat changed by the defendant in his capacity as an employe of the purchaser. *Held* that the purchaser was at liberty to repair and improve it within the limits of his contract, and that so long as the identity of the machine was not destroyed, its owner had the right to discard useless parts and add new ones which might improve its action.

One who has a license to use the whole of a machine does not become an infringer by the use of a part only.

TO expel mosquitoes, take of gum camphor a piece about one-third the size of a hen's egg, and evaporate it by placing it in a tin vessel and holding it over a lamp, taking care that it does not ignite. The smoke will soon fill the room and expel the mosquitoes, and they will not return, even though the windows should be left open all night.

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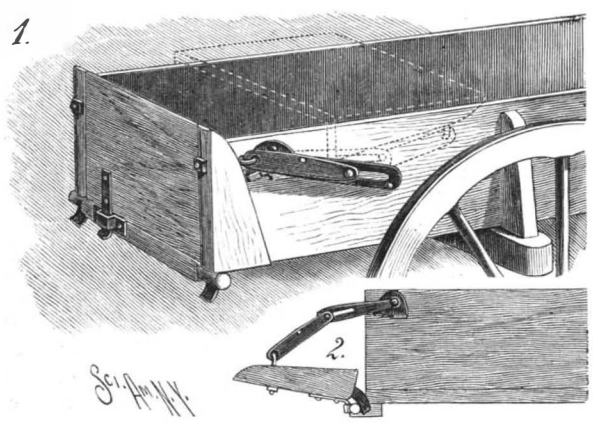
AN IMPROVED END GATE FOR VEHICLES.

The illustration herewith represents a wagon end board which has been patented by Mr. Theodore B. Burr, of Harlan, Iowa. It is adapted to be firmly locked in upright position, readily carried to a horizontal position over the wagon body for dumping, as shown in dotted lines in Fig. 1, or placed in horizontal position for use as a scoop, as shown in Fig. 2, without the dismounting of the driver from the vehicle. A transverse plate is attached to the bottom of the body, at the end, with a gudgeon at each extremity. Strap

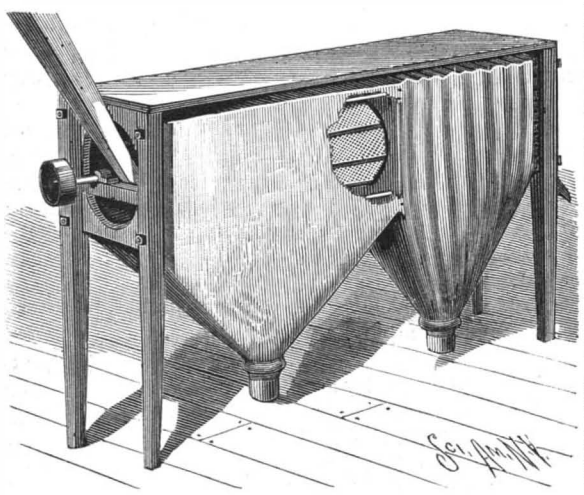


BURR'S END GATE FOR VEHICLES.

hinges attached to the end gate have a bearing upon the gudgeons, and jointed supporting bars connect the body and the end gate, stops on the side boards limiting the forward and rearward throw of the supporting bars, while a hinge on the outer face of the end gate has a detachable bearing on the keeper of the transverse body bar. The jointed supporting bars slide one upon the other at their pivotal point, and are pivoted at their outer ends to the body and to the end gate. When the end gate is to be used as a scoop-board, it is supported by the fully extended members of the supporting bars and the end hinges resting upon the gudgeons, together with the hinge bearing upon a strap plate. To uncover the end of the wagon body for dumping, the supporting bars are thrown upward to assume a perpendicular position, and the end gate is lifted up bodily, the hinges disengaging from the body plate, when the gate is carried up to the horizontal position shown in dotted lines.

AN IMPROVED BOLTING CHEST.

A bolting chest designed to facilitate the cutting off of the product at any desired point in separating the fine flour, middlings, etc., is shown in the accompanying illustration, and has been patented by Mr. Hugh McEwen, of Tiverton, Ontario, Canada. The reel, covered with any desired number of bolt cloth, is attached to a central longitudinal shaft journaled in bracket bearings in the ends of the frame, one extremity of the shaft having a drive pulley. The posts of the frame are connected by four rods, upon which a cut-off is held to slide longitudinally, this cut-off consisting of a rectangular plate with a central opening to receive the reel. The covering of the bolt is made of closely woven cloth, secured rigidly to the inner faces of the posts, and also to the upper edge of the cut-off, whereby two compartments are obtained, one at each side of the cut-off, while below the lower rods connecting the posts the cloth is connected and carried downward in funnel-shape, the lower extremity of each funnel having a metal sleeve. The cut-off has one or more set screws for holding it in such position along the longitudinal



McEWEN'S BOLTING CHEST.

rods as may be desired. The material to be bolted is passed into the reel by means of a suitable chute at the front of the machine, the tailings finding their exit through a chute at the rear, while the fine flour is passed through the reel at the forward end, and the middlings in the second compartment. As the chop approaches the center of the reel, and the grade of flour becomes more or less coarse, the separation desired may be varied by carrying the cut-off either forward or backward, thus enlarging or diminishing the area of the bolt discharging into either one or the other compartment.

Gaston Plante.

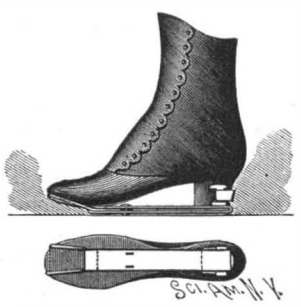
The well-known French electrician Gaston Plante died suddenly at the age of fifty-four. The principal work of Plante's life, says *Industries*, was his investigation into the voltameter, the practical result of which was the invention of the storage cell with lead plates. Plante experimented upon all conceivable metals and combinations of metals to be used for electrodes in voltameters, and the result of his numerous tests was to show that lead is, all things considered, the best active material from a practical point of view, though the amount of energy which he found possible to store per unit of weight was greater in the case of some other metals.

Like a true scientist, Plante gave his discoveries to the world without having patented his inventions, and others have reaped the benefit of his labors. The immediate cause which prompted him to undertake the long series of investigations was not the desire to find a storage battery, because in those days the application of dynamos to electric lighting was still unknown; it was the desire to study the effects of electric discharges of great quantity, which were not attainable with frictional machines and Leyden jars. The discovery of the lead accumulator was, so to speak, a by-product of his investigation. He also invented what he called the "machine rheostatique," being essentially a commutator which, on being turned by a crank, rapidly changed the grouping of the secondary cells from parallel to series.

Of late years Plante devoted himself almost exclusively to the reproduction of meteorological phenomena in the laboratory by electrical effects, and he succeeded in thus imitating hail, globular lightning, etc. His latest publication was a small book on this subject, and he has also contributed to the exhibition at Paris some very interesting apparatus and specimens in connection with this work.

A BOOT OR SHOE SOLE PROTECTOR.

The accompanying illustration represents a device for protecting the bottoms of boots or shoes from being soiled when fitting or trying them on in a store. It forms the subject of a patent issued to Mr. Louis P. Lang, of Allegheny, Pa. The device consists of a longitudinally expansible and contractible bottom cover, made preferably of rubber webbing, of a length to take in the greater portion of the tread of the boot or shoe. Between two thicknesses of this elastic material is a metal plate, united intermediately of its length to the material, and secured to the front end of the material is a wire loop, to be entered between the upper and sole, so as not to be seen by the person trying on the shoe. Secured to the rear end portion of the cover are opposite side uprights, from which a rubber band is held to stretch around and hold the protector on the heel of the shoe. The device is adapted for ready application on a shoe being fitted without attracting the notice of the customer.



LANG'S SOLE PROTECTOR.

Safe Transportation of Sulphuric Acid.

Herr Bickmann has patented in Germany a process for enabling sulphuric acid for manufacturing purposes to be safely transported. He takes advantage of a property of certain salts—of which alkaline sulphates are representatives—by which they give up their water of crystallization when heated and take it up again when cool; and he does so by mixing the salts in an *anhydrous* condition with a calculated quantity of sulphuric acid. The whole mass becomes granular, or may be formed into cakes; and when heated the whole liquefies and may be used as if it were sulphuric acid, for the presence of bisulphate of soda does no harm.

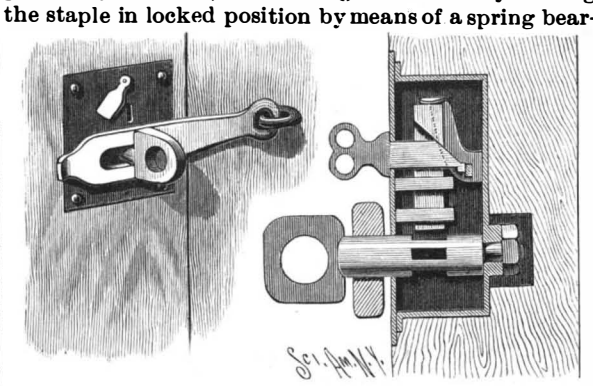
Physician's Registers for the Next Census.

The superintendent of the U. S. census for 1890, Robert P. Porter, earnestly asks the co-operation of the medical profession throughout the country in the perfection of the mortality and vital statistics for the year commencing June 1, 1889. With this view "physician's registers" are being issued to all who can be reached, and physicians not receiving them are invited to send to the census office in Washington therefor, and aid the department, by their use, in obtaining more complete statistics as to the annual births and deaths. In 1880, 26,000 such books were filled up and returned to the census office, and nearly all of them found useful in the way designed.

Myosotis alpestris, Victoria, proves to be a perfect border plant in this latitude, hardy without protection and easily multiplied by division or from seed.

AN IMPROVED LOCK.

A lock especially designed for use on freight car doors, wherein the parts are so constructed that the hasp may be secured to place by the lock itself, or by the ordinary form of padlock, is illustrated herewith, and has been patented by Mr. Haller C. Frost, of Farmington, Cal. The staple is held in place in the lock by a nut, and has an outwardly extending flattened head with a central aperture adapted to receive the bow of a padlock. The main body of the staple is preferably round, but it has recesses through its body adapted to receive a locking bar mounted above the staple and guided by brackets, this locking bar normally holding the staple in locked position by means of a spring bear-

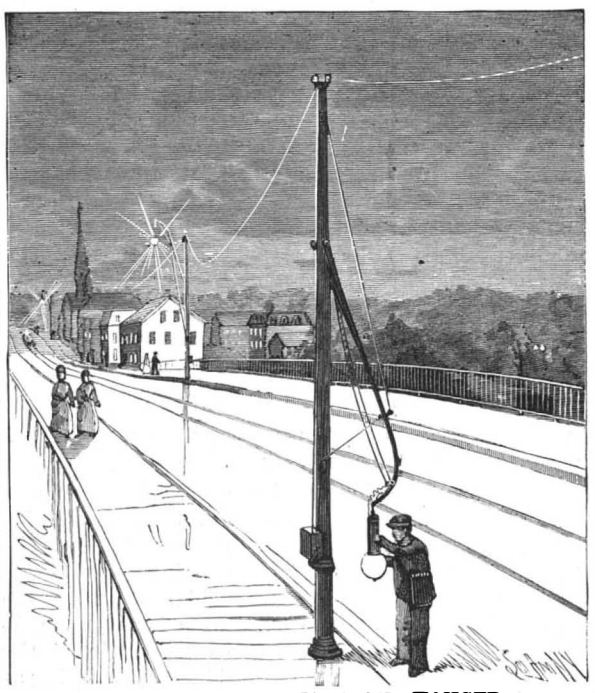


FROST'S LOCK FOR FREIGHT CAR DOORS.

ing upon the top of the locking bar and secured to the lock case. The locking bar has an inclined shoulder directly opposite the keyhole, and the key is formed with a nose projection and an inclined face, whereby, when the key is inserted, the locking bar will be moved against the tension of the spring to release the staple, as shown in the sectional view, so that the staple may be turned to a position to permit the withdrawal of the hasp.

ELECTRIC LAMP HANGER.

This device, shown in the accompanying illustration, invented and patented by Mr. John Bucksey, of No. 70½ Sparks Street, Ottawa, Canada, is simple and efficient in operation, elegant in appearance, and designed to save considerable labor in taking care of electric street lamps and expense for broken globes. The iron arm carrying the lamp is forked and is hinged to each side of the main post. The electric wires lead from insulators at head of post to insulators at the place of the hinge, and thence along the arm to the lamp, thus allowing the lamp to be raised or lowered without tension or slackening of the wires and permitting it also, if desired, to be raised, lowered, or locked in any position without being extinguished. To lower the lamp for cleaning, etc., the operator unlocks the box containing windlass at the foot of the post, inserts a crank and unwinds the drum, on which turns an endless cable. The lamp is thus lowered to position shown in the illustration, within easy reach of the operator, doing away with the necessity for climbing. The lamp being cleaned, etc., is once more raised into position, the crank is withdrawn, the door locked, and the operator goes on to the next lamp without loss of time. The drum or windlass operating the cable is simple and powerful in action, raising and lowering the lamp with ease, without jerking, and preserves a perfect up and down tension on the lamp-holding arm at all times. Lateral rigidity is insured by the arm being divided and hinging to each side of the post. With a 12 foot arm hinged 19 feet from the foot of the post, the lamp can be raised to a height of 30 feet from the ground, and cannot be tampered with in any way. This mechanism, as will be seen from cut, works equally well with the wires overhead or underground.



BUCKSEY'S ELECTRIC LAMP HANGER.

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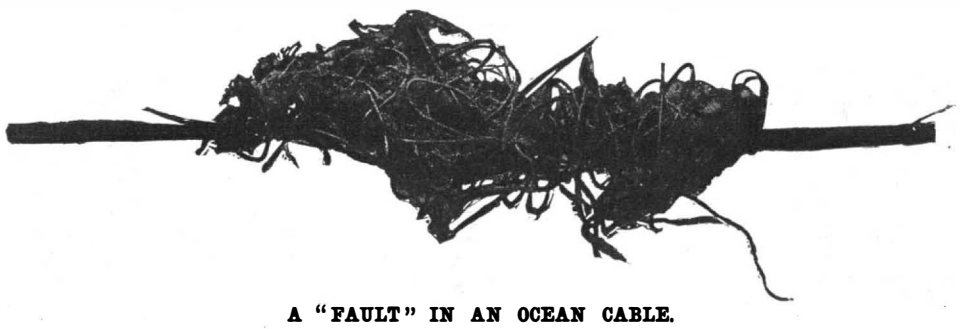
A "FAULT" IN AN OCEAN CABLE.

The value of laying ocean cables containing two cores was shown during the violent storm of November 25, 1888, when a fishing schooner about 26 miles from Gloucester, Mass., dragged her anchor for some distance until at last she hooked the Rockport cable of the Commercial Cable Company's system, riding to it for about forty-eight hours and producing the fault shown in the illustration. It was found when picking up the cable during the repair that she had dragged along it for some 400 yards, tearing off the outer covering of jute and compound, also one of the armor wires, rolling it up into a tangled mass and at last driving the end of the steel armor wire between the sheathing of the cable and through one of the cores, but leaving the other absolutely intact. With a single core cable of the ordinary type communication would have been interrupted until repairs were effected; but in this case, by means of the uninjured core, traffic was passing continuously with the exception of a few hours, during which the repair steamer had the cable cut in order to remove the fault. Considering the extreme violence of the gale and the large size of the vessel, it is surprising that the cable did not part.



A "FAULT" IN AN OCEAN CABLE.

The repair was made by the steamship Pouyer-Quertier, which was chartered for the purpose, as she was the only available cable steamer on this side of the Atlantic. Capt. S. Fossard, who commanded the steamer, showed such great skill in maneuvering her that although two and a half miles of cable was picked up and relaid across a tideway of four knots per hour, it was found, on completion of the repair, that the cable was only lengthened by a few yards.

The electrical department on board was in charge of Mr. Chas. Cuttriss, the company's electrician.

This remarkable "fault" has now been placed on exhibition at the Paris exposition.

We are indebted to the *Electrical World* for the cut and description.

ASPIRATORS FOR LABORATORY USE.

BY GEO. M. HOPKINS.

Wherever a head of water of ten feet or more is available, an aspirator is by far the most convenient instrument for producing a vacuum for filtration and fractional distillation. It is also adapted to a wide range of physical experiments.

Besides the advantage of convenience and compactness the aspirator has the further advantage over piston air pumps in the matter of cost. They may be had at prices varying from $1.50 to $4 or $5.

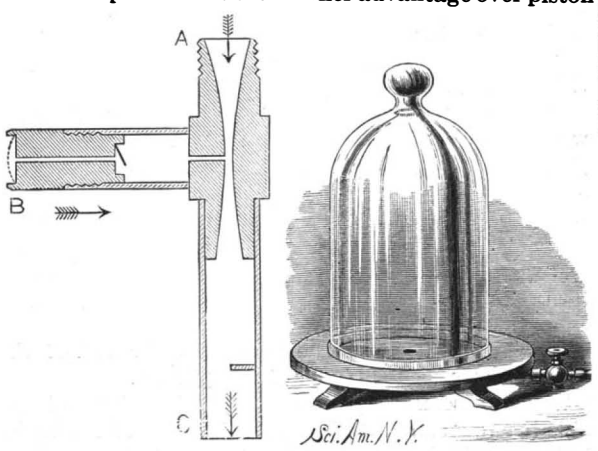


Fig. 3.—METAL ASPIRATOR. Fig. 6.—PLATE AND RECEIVER FOR ASPIRATOR.

Two kinds are in general use—one of glass, known as Bunsen's filter pump, and shown in Figs. 1 and 2; the other of brass, shown in Figs. 3, 4, and 5.

The glass aspirator can be purchased of almost any dealer in druggists' sundries or chemical glassware. Any expert glass blower can make it in a short time.

This instrument consists of an elongated bulb terminating in a crooked tube at the bottom and having a tapering nozzle inserted in the top and welded. The lower end of the nozzle is located directly opposite and near the crooked discharge tube. A side tube is connected with the bulb at a point near the junction of the nozzle and bulb.

This aspirator is used in the manner indicated in Fig. 2, *i. e.*, the upward extension of the nozzle is connected with a tap by a short piece of rubber tubing, and the side tube is connected by a piece of rubber tubing, with the vessel to be exhausted. When the water is allowed to flow through the aspirator, it leaps across the space between the nozzle and discharge tube and carries with it the air from the bulb, which is continually replaced by air from the vessel being exhausted.

It is necessary to securely fasten the ends of the rubber tube connected with the tap or the water pressure may force it off, thus causing the breaking of the instrument. To secure the best effects with this pump, it is necessary to connect a vertical tube 25 to 30 feet long with the discharge end of the pump.

The metallic aspirator shown in Figs. 3, 4, and 5 is of course free from all danger of being broken in use, and it has other qualities which render it superior to the glass instrument, one of which is a much higher efficiency, another is its ability to retain the vacuum should the flow of water be accidentally or purposely discontinued. It can be screwed directly on the water tap, and needs no additional pipe to cause it to work up to its full capacity; and where a head of water is not available, it may be inserted in a siphon having a vertical height of ten feet or more.

This instrument is made by Mr. E. C. Chapman, of Brooklyn, N. Y. Like all instruments of its class, it is based on the principle of the Giffard injector. Its great perfection, however, is due to Mr. C. J. Lawler and to its manufacturer. The construction of the aspirator is shown in section in Fig. 3. The water enters at A, as indicated by the arrow. The air enters at B, and both air and water are discharged at C. The water in going through the contracted passage forms a vacuum at the narrower part into which the air enters. The starting of the instrument is facilitated by a diaphragm which half closes the discharge tube. The water is prevented from entering the air pipe by a small check valve shown in the interior of the lateral tube. Much of the efficiency of this instrument is due to the accuracy with which the contracted passage is formed. A slight change in the shape of this passage seriously affects the results.

The vacuum produced by this aspirator is equal to that of the mercurial barometer, less the tension of aqueous vapor. That is to say, when the barometer is at 30 inches, the vacuum produced by the aspirator will be about 29½ inches. Such a vacuum can be produced by water under a pressure of five and one-half pounds.

In Fig. 4 is shown the aspirator applied to a Geissler tube. It quickly exhausts an 8 inch tube, so that the discharge of an induction coil will readily pass through. By placing a tee in the connecting pipe, the Geissler tube can be filled with different gases. Each will exhibit its peculiar color as the spark passes. The vacuum is not high enough for a perfected Geissler tube, but it is sufficient for the greater part of vacuum experiments. The aspirator can be arranged to produce a continuous blast sufficient for the operation of a blowpipe, and for other uses requiring a moderate amount of air or gas under pressure.

The method of accomplishing this is illustrated in Fig. 5. The instrument is arranged to discharge into a bottle or other vessel having an overflow, and the air for the blast is taken out through the angled tube inserted in the stopper of the bottle. The amount of air pressure is regulated by the water pressure and the height of the overflow pipe.

For many vacuum experiments a plate provided with a central aperture, and having a tube extending from the aperture to the edge of the plate, will be found useful. The tube is provided with a suitable valve, which closes communication with the aspirator, and which also serves to admit air, when required, to the receiver fitted to the plate. This plate and various accessories are like the plate and accessories of a piston air pump. Communication is established between the tube of the plate and the aspirator by means of a pure rubber tube which is practically air tight.

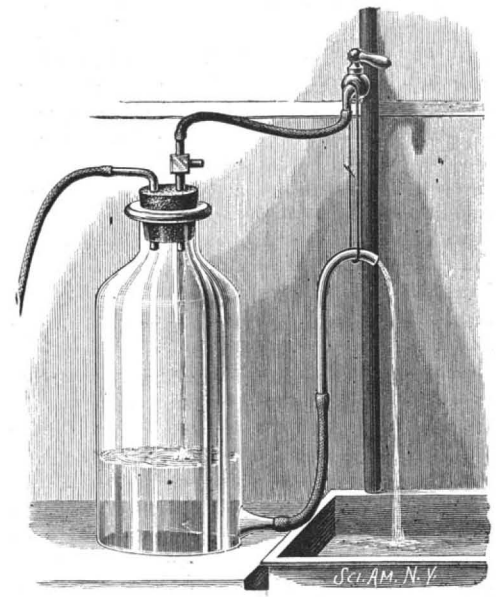


Fig. 5.—BLAST PRODUCED BY THE ASPIRATOR.

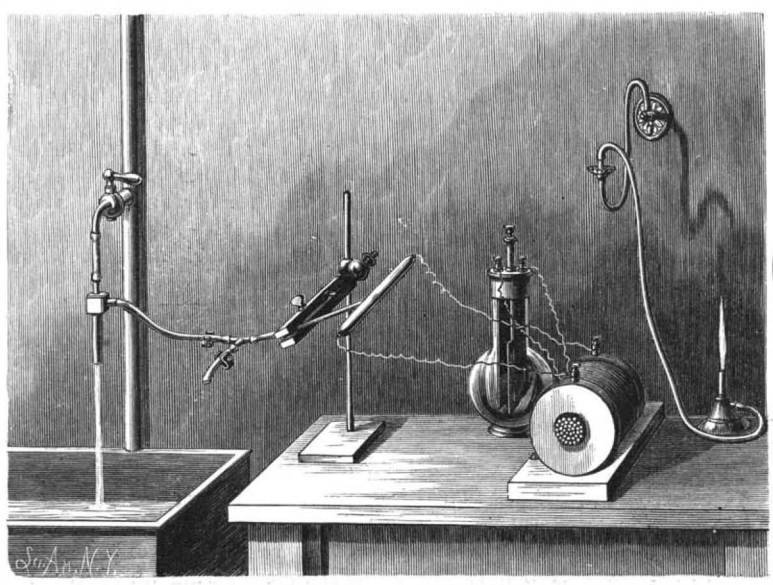


Fig. 4.—EXHAUSTING GEISSLER TUBE.

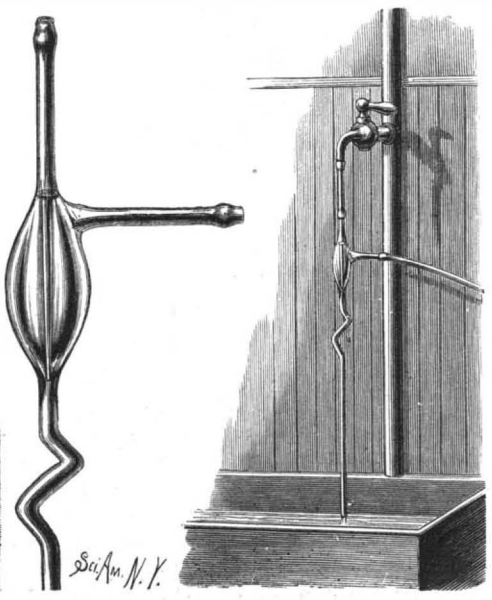


Fig. 1.—BUNSEN FILTER PUMP.—Fig. 2.

New Metals.

According to the *Chemiker Zeitung* (Coethen), at the last sitting of the Russian Mineralogical Society, K. D. Chrustschoff demonstrated the existence of a new metal which he has just discovered, and to which he gives the name russium. It approximates closely to thorium, and is one of the bodies whose existence was foreseen by Prof. Mendelejeff. We learn also that Dr. Kruss has named the metal which he has detected along with nickel and cobalt, gnomium.

Not Bad Advice.

Mr. Mechanic, if your mind runs to the invention of "small things," as they are often called in unwise contempt, you may hit upon a "big bonanza." Westinghouse has made $20,000,000 out of the air brake. It was called at first a "small thing," using air in that way, but it has panned out well. Other "small things" have rewarded mechanics well. The lead pencil rubber tip cleared its inventor $100,000; the metal rivet or eyelet for miners' coat and trousers pockets brought its inventor a fortune; boot and shoe heel and sole plates of metal cleared $1,250,000; the glass bell inverted over lamps and gas jets cleared a fortune; the simple plan of fastening powdered emery on cloth made a fortune; the roller skate cleared $1,000,000 before the craze died out; the gimlet screw realized millions; copper tips for shoes netted millions; the simple needle threader netted $10,000 a year; toys and playthings have cleared thousands; the ball with the rubber string brought an income of $50,000 a year; the "Dancing Jim Crow" netted $75,000 a year; Pharaoh's serpents cleared $50,000; the "wheel of life" cleared $50,000; the chameleon top cleared a fortune; the "Pigs in Clover" puzzle has within one year made its inventor a fortune; the pencil sharpener cleared a fortune. Hundreds of "small things" have turned out well. If you have an idea, bring it out and let the busy and inquisitive world see it. The mechanics who have been enriched by little inventions far exceed in number those who have reaped fame and fortune by great inventions. Put on your thinking cap, Mr. Mechanic, and dive into the world of possibilities. The fortune is there if you only know how to find it.—*The Iron Industry Gazette.*

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The New Steel Steamer Puritan.

The new and magnificent passenger steamer Puritan, the latest and finest example of American marine architecture, went on her first public trial trip, down New York harbor, on the 13th of June. The trip was a great success. She belongs to the Fall River line.

The model and general plans were designed by Mr. Geo. Pierce, Supervisor of Steamers of the Old Colony Steamboat Company; the details of steel hull, etc., by Mr. Edward Faron, of the Delaware River Ship and Engine Building Company. The hull was built at Chester, Pa.

Her principal dimensions are as follows: Length over all, 420 feet; length on the water line, 404 feet; width of hull, 52 feet; extreme breadth over guards, 91 feet; depth of hull amidships, 21 feet 6 inches; height of dome from base line, 63 feet; whole depth, from base line to top of house over the engine, 70 feet. Her total displacement, ready for a trip, is 4,150 tons, and her gross tonnage, 4,650 tons.

The Puritan is fireproof and unsinkable. She has a double hull, is divided into 59 watertight compartments, 52 between the hulls and 7 by athwartship bulkheads. Her decks are of steel, wood covered. Her masts are of steel, and hollow, to serve as ventilators, and are 22 inches in diameter.

Her wheels are of steel, 35 feet in diameter outside the buckets. The buckets are 14 feet long and 5 feet wide; each bucket of steel, seven-eighths inch thick, and weighing 2,800 ponnds, without rocking arms and brackets attached. The total weight of each wheel is 100 tons. The two together are in the nature of enormous flywheels for the machinery. The wheels are of the kind known as "feathering," and the engine will drive them at the rate of 24 revolutions a minute.

Her rudder is 14 feet 6 inches fore and aft, average height 13 feet, whole length of stock 18 feet. It is made of steel, filled with wood between the plates, and weighs nearly 30,000 pounds.

Of her machinery, boilers, etc., Messrs. W. & A. Fletcher & Co. (North River Iron Works) were the builders, and they were also the contractors for the building and completion of the ship in every part.

The Puritan has a compound, vertical beam, surface condensing engine of 7,500 horse power. The high-pressure cylinder is 75 inches in diameter and 9 feet stroke of piston. The low-pressure cylinder is 110 inches in diameter and 14 feet stroke of piston. A horse and wagon could be driven through this cylinder if laid on its side. The surface condenser has 15,000 square feet of cooling surface and weighs 53 tons. Of condenser tubes of brass there are 14½ miles in the Puritan. Her working beam is the largest ever made, being 34 feet in length from center to center, 17 feet wide, and weighing 42 tons. When it is considered that the section of beam strap measures 9½x11¼ inches, one may get an idea of the enormous strain and the strength of resistance of this beam. The main center of the beam is 19 inches in diameter in bearing. The shafts are 27 inches in diameter in main bearing and 30 inches in gunwale bearing, and are the largest ever made in this country. They weigh 40 tons each. The cranks weigh 9 tons each. The crank pin is enormous, the bearing being 19 inches in diameter and 22 inches long.

The ponderous machinery of the Puritan is handled by a small supplementary engine. The gallows frame is of heavy steel plate, and by its angles easily supports the enormous working beam.

She has eight steel boilers of the Redfield return tubular type, and the maximum working pressure is 110 lb. to the square inch. Six of these boilers are 18 feet 1 inch in width and 15 feet 2 inches long; the other two are 10 feet wide and 14 feet long. Each of the wide boilers has two shells; the narrow boilers have one each, 7 feet 8 inches in diameter. The boilers contain 850 square feet of grate surface and 26,000 square feet of heating surface. The products of combustion pass through two superheaters, 8 feet 10 inches inside diameter and 12 feet 4 inches outside diameter by 12 feet high; thence into two smokestacks, the top of each being 101 feet 1 inch from the keel. The fire room is 78×12½ feet. There is a donkey boiler on the main deck for auxiliary purposes. Her steam steering apparatus has engine of two cylinders, each 24 inches diameter, 18 inches in stroke; this engine alone is powerful enough for a big tug boat.

There are two centrifugal circulating pumps, each capable of throwing 10,000 gallons per minute. Besides these there are three other large pumps, with a combined capacity of 2,000 gallons per minute. Novel features are the three steam capstans, one forward and one on each quarter, to be used in docking the boat; each capstan has a double cylinder engine, each cylinder 12 inches in diameter and 14 inches stroke. She has two Sturtevant blowers, furnishing fresh air for fire room, each capable of 50,000 feet per minute. She will burn about 120 tons of coal on the trip from New York to Fall River and back.

The hurricane or extreme upper deck is open for passengers, and has a promenade entirely atound its outer edge. On the saloon deck there is a continuous promenade entirely around its area, outside the wheels. The outer promenade space of the hurricane deck is 10 feet wide and 42 feet above the water-line. From this deck the most magnificent outlooks are afforded.

The dining saloon is 108 feet 4 inches in length, by 30 feet in width, and 12 feet in height.

From stem to stern, and in every nook and corner of the ship, the electric wire is to be found. In all, there are twelve miles of this wire, and, including annunciators, fire alarm, etc., there are twenty miles of wire on the ship, and twelve thousand feet of steam pipe. There are capacious gangways, grand and imposing staircases, heavy with brass and mahogany, lofty cornices, and ceilings supported by tasteful pilasters, the tapering columns of which, in relief, flank exquisitely tinted paneling throughout the length of her grand and minor saloons. And over all this artistic work and exuberant coloring, the incandescent electric light sheds its soft rays. Every convenience known to civilization, and which can contribute to the ease and comfort of the traveler on land or when afloat, is included in the internal arrangements of this floating caravansary. The artistic and luxuriant sense of the beholder is also abundantly appealed to.

The electric light plant of the Puritan is the most perfect of its kind, and its kind is of the best known. The system used is the Edison incandescent lighting, and it is furnished by the Edison United Manufacturing Company. The currents are generated by four dynamos of special type and construction, each having a capacity of four hundred lights, or a total of 1,600 lights as a safety load, but capable of maintaining 1,850 lights if required. The dynamos are located in the forward part of the boat, under the officers' cabin.

They are connected in pairs, the motor being supplied by two Armington & Sims special double engines of fifty horse power each, two of the dynamos being connected with each engine, and the two connected with each other by direct shafts, so that one or both dynamos can be used at will. The intention has been to make this the most perfect installation ever constructed, the test being higher than ever before required or given by any electric company.

For fire fighting, the Puritan is equipped with the most thorough and complete apparatus, including steam and hand pumps, extinguishers, tools, etc. There are fifty connections to the steam pumps, in different parts of the boat, for fire purposes exclusively. She has three hand pumps, and these are of unusual size. She has eight Harkness fire extinguishers, and carries 175 fire pails and 36 axes distributed through the ship at convenient points.

The life-saving service and appliances of the Puritan are also of the best approved establishment and effectiveness. As is the case of all the boats of the Fall River line, the life-saving crew is appointed with sole reference to this service, and all its drill and occupation are in the way of perfecting methods in this department.

As an adjunct of the life-saving service, and for use in case the whole ship's company should be threatened, the Puritan carries a dozen 26 foot life-boats, 12 life-rafts, and 1,400 life-preservers.

The ornamentation of the Puritan has been in charge of Mr. Frank Hill Smith, of Boston, and to him are due the artistic effects in design and finish that this ship presents. The details of architecture, ornament, painting, etc., have been worked out and applied by him.

From floor to dome of the saloon deck every foot of surface of the walls, galleries, and ceilings presents a marvel of decorative finish, artistic in style and design, exquisitely tasteful in coloring, and blending the finest ornamental effects in rich succession.

The Italian Cruiser Piemonte.

In the latter part of 1884 the performance of the Chilian cruiser Esmeralda, constructed by Sir W. G. Armstrong, Mitchell & Co., attraction general attention. She was a vessel of 3,000 tons displacement, carried as armament two 25 ton guns, six 6 in. guns, and a number of Hotchkiss and Gatling guns, and she attained the then unprecedented speed of 18¼ knots. Her steam trials were attended by Mr. George Rendel, by whom she had been designed, but who had recently severed his connection with Sir W. G. Armstrong, Mitchell & Co., and had become a civil lord of the Admiralty, by Admiral Brandreth (Controller of the Navy), and Admiral Sir Frederick Richards, who also were members of the Board of Admiralty; by Captain Hopkins (Director of Naval Ordnance), and by several members of the constructive and engineering staff of the Admiralty. Since this period numerous vessels of the class have been added to our own and other navies, and great advances have been made, but none comparable with that now achieved in the Italian cruiser Piemonte, also constructed by Sir W. G. Armstrong, Mitchell & Co. This vessel was described a few weeks back at the meetings of the Institution of Naval Archi tects by her designer, Mr. P. Watts, and the bulk of his paper and the discussion which took place thereon were published in our issue of April 26. When this paper was read, however, the steam trials had not been completed, and the results given were based upon a single preliminary run, at which the full power of the machinery had not been developed. The official trials have now been completed, and the results are before us. During a natural draught trial of four hours' duration, a mean speed of 20·4 knots was attained with about 7,000 indicated horse power; and during a forced draught trial of one and one-half hours' duration, a measured mile speed of 22·3 knots was attained with a mean power of 12,700 horses, the maximum power which was maintained for a considerable time exceeding 13,000 horse power. The displacement of this vessel is only 2,500 tons, yet she carries six 6 in. quick-firing guns, six 4¾ in. quick-firing guns, and a large number of smaller guns. She is protected by a strong armor deck with sloping sides, and she has attained a greater speed than that contemplated in the Blenheim.

At the present moment she is by a great deal the fastest cruiser afloat. She is, we believe, two knots faster than any of the cruisers built by our own Admiralty. Moreover, she is specially designed for steaming with open stokeholds, and she can attain a speed of 20½ knots with natural draught, or with a pressure in the stokeholds not exceeding half an inch of water, the pressure allowed by the Admiralty for developing the draught when the wind is not sufficiently favorable for the purpose; 20½ knots may be regarded as her ocean-going speed.

The great importance of this high performance with natural draught will be understood by those conversant with the effect of forced draught upon ordinary marine boilers, and will be fully appreciated when it is remembered that the Admiralty in a recently issued circular directs that forced draught appliances are not to be used at their full power, or, in other words, with above ½ inch of pressure, except in circumstances of emergency, and then only for short periods when the maintenance of the highest possible speed for three or four hours may be of great advantage. The Piemonte can steam continuously across the ocean a knot faster than any of the Admiralty cruisers can steam with forced draught, which they can only maintain on an emergency for three or four hours.

The armor deck of the Piemonte has sloping sides 3 inches thick, as in the Admiralty cruisers; upon these coal can be carried, and in this condition it is claimed that the deck is proof against the attack of modern shell guns up to guns of 6 inches caliber.

This ship is the first to be fitted with new quick-firing guns. Speaking of her armament on a recent occasion, Lord Armstrong said, "She will be capable of discharging against an adversary, in a given time, twice the weight of shot and shell that could be fired by the largest war vessel now afloat, not excluding the leviathan battle ships of five or six times her size, which could ill withstand the torrent of shell which the Piemonte could pour into the large unarmored portions of their structure."

The machinery of the Piemonte is wholly below the water line; it has been constructed by Messrs. Humphrys, Tennant, and Co., Deptford. There are two sets of vertical triple expansion engines, in each of which there are two low pressure cylinders, so that there are in each four cranks operated upon. Ample distilling apparatus is provided for making fresh water for the boilers. At full speed with forced draught, although the enormous power of 13,000 horses is developed, the vibration at the extreme after end of the ship never exceeds 12 inches in amplitude.

The vessel can carry 600 tons of coal, which will enable her to steam at full speed a distance of 1,950 knots, but she will be able to maintain a cruising speed of from 10 to 12 knots for from 50 to 50 days, during which she could cover a distance of 13,500 knots.

Special arrangements have been made for securing good turning power in the ship, a large balance rudder is provided, and much of the after deadwood is removed, and at the trials made it was shown that the ship could maneuver exceedingly well, completing a circle of 508 yards in 3 minutes 24 seconds.

Lord Armstrong, probably the strongest advocate for the construction of this type of vessel, has enumerated as their chief features, "Great speed and nimbleness of movement combined with great offensive power," and "little or no side armor, but otherwise constructed to minimize the effect of projectiles," and in the Piemonte all of these features have been secured in the very highest degree, and there can be no question that for her size she is the most formidable cruiser afloat. We are very glad she has fallen into the hands of such a friendly government as that of Italy.—*Engineering.*

Does Heating Milk Affect the Quality or Quantity of Butter?

Experimental studies of this question at Cornell University show the following results: First, that there is a loss of butter when the milk is allowed to cool much below the normal heat of the cow before being put in the creamer; second, that while there may not be any very great increase of butter when the milk is heated, there is no risk of injuring the quality of the butter by incorporating an excess of casein, even when the milk is heated as high as 135 degrees.

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Correspondence.

A Correction as to Earth Theories.

To the Editor of the Scientific American:

If the reviewer who, on page 344 of the issue of June 1, 1889, of the SCIENTIFIC AMERICAN, noticed an article by Prof. Joseph F. James (not Jones), will again read the article he noticed, he will find that the Professor does not assume "the earth to be a hollow sphere" and so on, but that he is quoting from some one else who does the assuming. The Professor does not desire to be credited with any such sort of scientific knowledge. He leaves that to others who speculate upon the subject. Suffice it to say, he does not believe in the crude theories he has noticed. JOSEPH F. JAMES.

Washington, D. C.

Novel Experiments on Light and Electricity.

The following is from the London *Electrician:* "An experiment described by M. J. Borgman has an important bearing upon the explanation of the remarkable discovery of M. Hallwachs, in which a beam of light seems to act as a conductor for an electric current. The latter experiment consisted in placing a piece of metallic gauze parallel with, but insulated from, a second sheet of metal. The first is connected with the positive, the second with the negative, pole of a battery, and in one of the leads a delicate galvanometer is placed. If, now, a beam of light be made to pass through the gauze, and to fall on the plate behind, a current is set up in the circuit, and continues to flow as long as the illumination is maintained. It has, moreover, been shown that the action is due to the ultra-violet waves. Now, M. Borgman wanted to ascertain whether or not the effect was instantaneous; that is to say, whether the commencement and the cessation of the current was or was not simultaneous with that of the illumination. M. Borgman probably reasoned that, if the beam acted in some sense as a conductor of the current, the effect must be instantaneous; while, if the phenomenon resulted from some secondary action, it would probably go on increasing up to a certain point with the duration of the illumination, and it would also probably continue for a time after the light had been cut off. His method of making the test was equally simple and ingenious. The light was interrupted at rapid intervals by means of a rotating disk with holes or slits, and he placed a telephone in circuit with the battery. It is, then, obvious that, if the effect is instantaneous, the telephone will produce a note corresponding in pitch to the velocity of the disk; if otherwise, there will be silence. There was silence. A make and break in any other part of the circuit could be heard, but not in the beam of light: hence we must seek for some secondary action on the surface of the plates to explain M. Hallwach's experiments."

Lead Poisoning.

At a meeting of the Practitioners' Society of New York, Dr. Kinnicutt, the president, reported two cases of lead poisoning occurring from an unusual source. The first patient was admitted to St. Luke's Hospital, suffering from lead colic and "wrist-drop." He had been employed as a florist; and on investigation by Dr. Vaughan, the house physician, it was found that he had been in the habit of biting off the ends of the tinfoil used as wrappers for hand bouquets. The tinfoil used for this purpose contained as much as 80 per cent of lead. There was no history of other sources of lead poisoning. The second patient was admitted to the hospital, suffering from lead colic, and presenting a typical blue gum line. He had been in the habit, for several weeks, of drinking beer from bottles which, he said, were cleaned by his employer with lead shot. Dr. R. F. Weir recalled the fact that several cases of lead poisoning, some years ago, had been traced to the use of a popular brand of chewing tobacco which was wrapped in tinfoil. Dr. Dana referred to some cases of poisoning which had been traced to the consumption of certain beverages coming in bottles with so-called patent stoppers. He said that he had recently had two Chinese patients in the hospital service, both of whom were suffering from lead poisoning. He was unable to trace the source of the poisoning.—*Science.*

New Steel Process.

The Redemann-Tilford steel process is understood to consist of a bath with glycerine as the basis. This bath changes the whole structure of the metal submitted to it, and increases its ductile and tensile strength far beyond any record that has yet been established by either private or governmental test.

When it is stated that the very finest and strongest grade of steel, much better than any now in use, can be made by this process at little more than the cost of crude Bessemer steel, the value of the discovery may be understood. Thus far, in making experiments, every character of tool and steel goods has been worked with, and the process has been successfully used upon all.—*Manufacturers' Record.*

Clark University, Worcester, Mass.

This new and magnificent institution of learning will open its doors and begin its grand career of usefulness in October next. Applications of students for entrance are now being received.

Clark University was founded by the munificence of a native of Worcester County, Jonas G. Clark, Esq., whose plans, conceived more than twenty years ago, have gradually grown with his fortune. His affairs have been so arranged as to allow long intervals for travel and study. During eight years thus spent, the leading foreign institutions of learning, old and new, were visited and their records gathered and read. These studies centered about the means by which the highest culture of one generation is best transmitted to the ablest youths of the next, and especially about the external conditions most favorable for increasing the sum of human knowledge. To the improvement of these means and the enlargement of these conditions, the new university will be devoted. His pecuniary endowments to the institution rise to several millions of dollars.

It is the strong and express desire of the founder that the highest possible academic standards be here forever maintained; that special opportunities and inducements be offered to research; that to this end the instructors be not overburdened with teaching or examinations; that all available experience, both of older countries and our own, be freely utilized, and that new measures, and even innovations, if really helpful to the highest needs of modern science and culture, be no less freely adopted; in fine, that the great opportunities of a new foundation in this land and age be diligently explored and improved.

Prof. G. Stanley Hall, formerly of Johns Hopkins University, is the president. He is one of the ablest of scientific men.

The corps of professors and instructors is large, and embraces many prominent men of talent of the highest order. Every department will be made as complete and effective as possible.

The organization of all departments will be gradual, and the foundation period of the university will cover some years.

Apparatus is being extensively ordered of the best makers in this country and in Europe, chiefly from those who devote themselves to the special class of apparatus in which they excel.

The university is situated in Worcester, the third city of New England in size, with 80,000 inhabitants. It is one hour westward from Boston by rail, and five hours from New York City. Central among the best New England colleges, the location is most favorably chosen for attempting the next step in the higher university development of the country.

Worcester is also the seat of the following institutions of an educational character:

The American Antiquarian Society, an institution of national character and repute, organized in 1812, with a library of 85,000 volumes, possessing funds and collections, and issuing publications of its own.

The Worcester Free Public Library, containing about 75,000 volumes and receiving about 250 periodicals.

The Worcester Polytechnical Institute, incorporated in 1865, with three large and well appointed buildings, fifteen instructors, and a three years' course mainly in the sciences and their application to the practical arts.

The Worcester Lyceum and Natural History Association, incorporated in 1866, and containing extensive local collections.

The College of the Holy Cross, a Catholic institution of high grade, incorporated in 1865, and with a corps of fifteen instructors.

In addition to these may be mentioned a law library of 12,000 volumes; a medical library of 8,000 volumes; a State Normal School with a two years' course, eight instructors, and about two hundred students; one high school; the Highland Military Academy, founded in 1858, with seven instructors; the Worcester Academy, a private institution, founded in 1874; and several other libraries, societies, and educational institutions.

The university is located in the western part of the city, about a mile from the central station. The grounds are over nine acres in extent.

A plain, substantial, and well-appointed central building, 204 by 114 feet, four stories high, and with superior facilities for heating, lighting, and ventilation, has been constructed of brick and granite, and finished throughout in oak.

A chemical laboratory, designed after consulting many experts and plans of recent European buildings, and containing about fifty rooms, is nearly completed.

The foundations of a still larger department building are laid.

The work of instruction will begin on Wednesday, October 2, 1889, in the following departments: Physics, under direction of Prof. Albert A. Michelson; Biology, Dr. Warren P. Lombard; Psychology, President Hall; Chemistry and Mathematics, professors not yet announced.

The charge for tuition, giving all the privileges of the university, but not covering laboratory fees, will be $200 per annum.

Felling Trees by Electricity.

Hitherto machines for felling trees have been driven by steam power, but this is often inconvenient, especially in thick woods, because the heavy machinery, including a boiler, must be placed near the tree to be cut. These machines, therefore, can only be used on the borders of forests or in open spaces readily reached by good roads. The London *Times*, however, reports that electric power has been adopted in the Galician forests. Usually in such machines the trunk is sawn, but in this case it is drilled with a series of holes close together. When the wood is of a soft nature, the drill has a sweeping motion, and cuts into the trunk by means of cutting edges on its sides. The drill is actuated by an electric motor mounted on a carriage, which is comparatively light and which can be brought up close to the tree and fastened to it. The motor is capable of turning around its vertical axis, and the drill is geared to it in such a manner that it can turn through an arc of a circle and make a sweeping cut into the trunk. The first cut made, the drill is advanced a few inches and another section of the wood is removed in the same way, until the trunk is half severed. It is then clamped, to keep the cut from closing, and the operation continued until it would be unsafe to go on. The remainder is finished by a hand saw or an ax. The current is conveyed to the motor by insulated wires brought through the forest from a generator placed at some convenient site, which may be at a distance from the scene of operations. The generator may be driven by steam or water power, and does not need to be transported from place to place.

Effect of Light on Magnetism.

At a recent meeting of the London Physical Society, Mr. Shelford Bidwell showed a lecture experiment illustrating the effect of heat on the magnetic susceptibility of nickel and an experiment showing an effect of light on magnetism. In the first experiment a piece of nickel was attached to one side of a copper pendulum bob, which was held out of the vertical by bringing the nickel in contact with a fixed magnet. On placing a spirit lamp flame below the nickel, the bob was, after a short time, released, and oscillated until the nickel had cooled, when it was again attracted and the operation repeated itself. The second experiment had been recently shown before the Royal Society. One end of an iron bar, which had been magnetized and then demagnetized, was placed near a magnetometer needle. On directing a beam of light on the bar an immediate deflection of the needle resulted, and on cutting off the light, the needle promptly returned to near its initial position. The direction of magnetization induced by the light is the same as the previous magnetization, and the bar seems to be in an unstable magnetic state. That the effect is due to light and not heat, the author thinks is rendered probable by the suddenness of the action. The president said he had tried the experiment himself and failed to get any effect, but after seeing the arrangement of apparatus used, he believed his non-success due to the comparatively great distance between his bar and needle. Mr. C. Richardson asked if the results were different for different colored rays, and Prof. S. P. Thompson inquired whether the magnitude of the effect varied with the intensity of illumination as in selenium, and also if any change was produced by altering the direction of vibration of the incident light. Mr. G. M. Whipple wished to know whether any difference was produced by blackening the bars, and as bearing somewhat on the same subject mentioned an induction magnetometer in which an iron bar used was demagnetized by plunging in hot water. The results obtained were very irregular after the first magnetization, and this may have been due to the instability shown to exist by Mr. Bidwell's experiment. In reply, Mr. Bidwell said red light produces most effect, and blackening the bar makes the action much slower. As regards selenium, the character of the effect is similar, but he believes the causes to be different. Polarized light produces no change. In answer to Prof. Herschel, he said that any part of the bar is sensitive to light, and showed that illuminating both sides of the bar increased the effect.

Success of the British Canadian Steamers.

The Canadian Pacific line of steamers from Vancouver to Japan have now been running for a little over a year, and are completely cutting out the Pacific mail steamers under the United States flag which sail from San Francisco. The rates of freight are much the same, yet in the past tea season the Canadian Pacific steamers carried 5,357,944 pounds of Japan tea, against only 735,265 pounds carried by their American rivals, and the curious circumstance is that more than nine-tenths of this tea is consumed in the United States. Not in tea only, but in all other goods, is the preference given to the Canadian line, which now carries a large part of the transcontinental traffic, as well as that destined for the United States. The journey to Vancouver is shorter, but this alone would not account for this wholesale transfer of trade.—*Canadian Manufacturer.*

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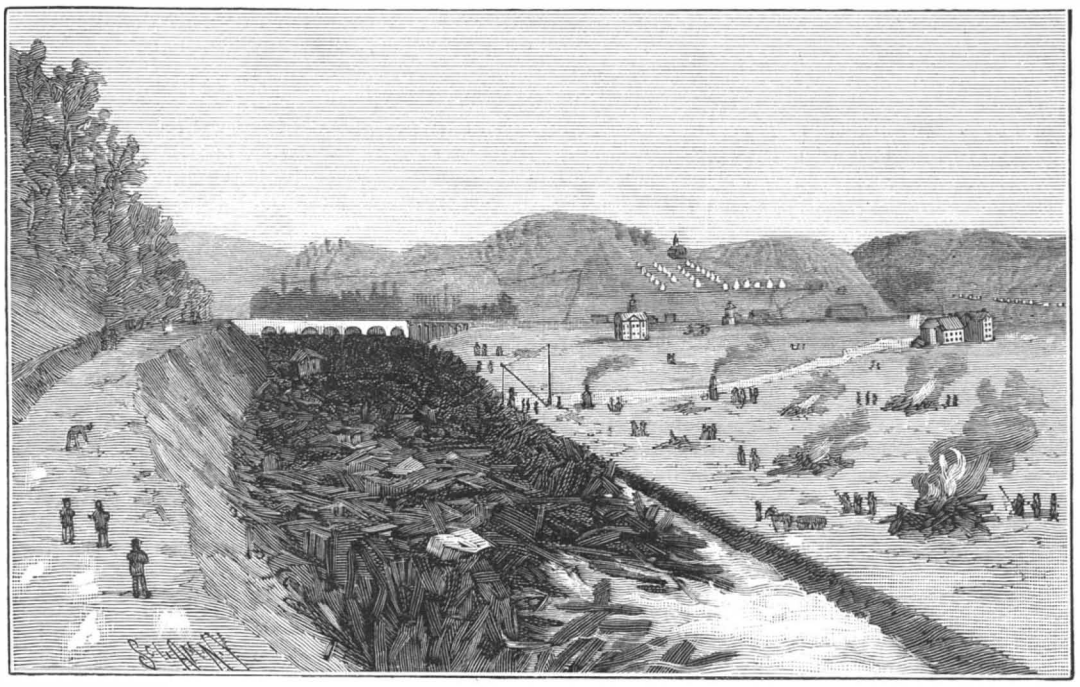
COLLAPSE OF THE SOUTH FORK DAM AND DESTRUCTION OF JOHNSTOWN.

(*Continued from first page.*)

twenty feet wide, and rock was spread over both faces. The material of the work was clay or silt, apparently most excellent material, if properly used. It was of such nature as to form a thoroughly impervious barrier though, unfortunately, very easily cut away on its exterior surface. In the core of the structure a row of sheet piling could be seen which had been used in the original construction, but which added very little to its strength. The material exhibited marks of stratification, showing what miners would call "stopes" or steps upon the sides of the crevasse. At the eastern end the regular spillway or overflow was placed. This is a sluice or canal cut through the rock, about forty feet wide, with its bottom eight or ten feet below the top of the dam. It was crossed by two bridges, and some idea of its size can be derived from the evident length of the one shown in perspective. A fish screen, to prevent the fish from escaping, crossed the channel, but as it was only three feet high it could not have greatly impeded the water. It is not now in place, being broken and destroyed. It is quite possible that it was carried away before the overflow began. Five lines of cast iron pipe, about twenty inches in diameter, ran through the base of the dam, terminating in masonry tunnels reaching well outside of the base. These were permanently closed. The ruin of the gate house for these pipes is shown in one of the cuts. On top of the gate house, at the foot of the inner slope of the dam, as shown in one of our views, there was originally a wooden tower, containing appliances for opening and closing the gates. This tower was carried to only a few feet above the water level, and was reached only by boat. After a former break in the dam, some years ago, this tower was burned, and when the dam was rebuilt this central outlet was permanently closed. Some of the charred timbers remaining from this tower are still to be seen around what remains of the old gate house. The same illustration gives a sectional view showing the comparative area of the regular spillway, but which is located on the other end of the dam from that shown in the same view.

The following details of the overflow and collapse of the dam, as obtained at the spot by the representative of the SCIENTIFIC AMERICAN from a witness of the whole occurrence, coincide with Mr. Parke's account. The water had been rising rapidly, and at midday was within a foot of the top. The spillway was discharging water to its utmost capacity, producing a perfect cataract. A little after one o'clock the top was reached, and before long the water began to flow across the roadway at the ends of the dam. The streams, growing wider, worked their way toward the center, and eventually poured over that portion as well. Then the destruction began. The water began to cut into the soft material, dredging away the unsupported clay, and every instant increasing the opening. In about an hour and a half the reservoir was empty, and a crevasse 350 feet wide at the top was formed, through whose bottom the stream flowed.

Whatever may be the finally accepted view as to the principal cause of the great disaster, it is evident that the dam itself was abundantly strong enough to hold back the water contained in the reservoir until a breach had been made at the top by the water flowing over its face. To prevent this the spillway at the side had been constructed. This spillway was made through solid rock, and had afforded an ample outlet for all surplus water, without danger to the dam, for a period of eight years. That this spillway should have been made still deeper is now evident enough, and had this been done, and the water thus prevented from pouring over the face of the dam, all positive evidence is wanting to prove the insufficiency of the dam to hold back the water of the reservoir. The dam was not undermined, but was cut away from the top downward, as if by a hydraulic dredging machine or mining plant.

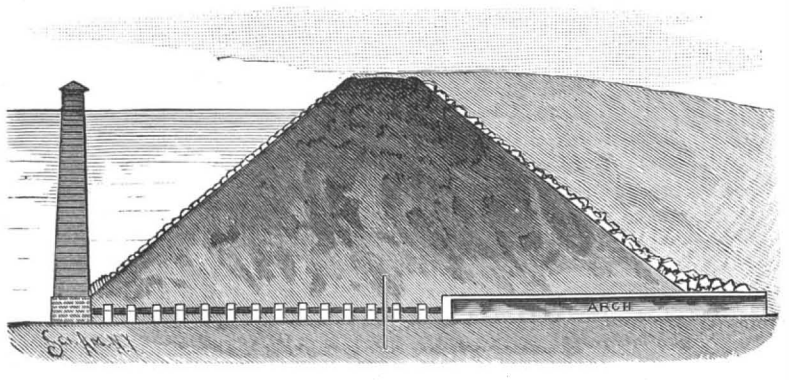


THE STONE BRIDGE AND THE BLOCKADE ABOVE IT.

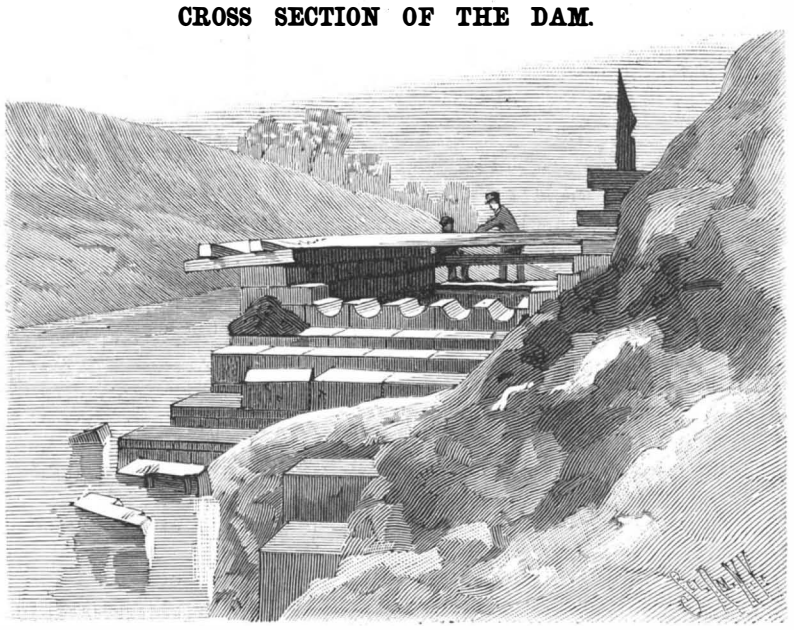
The water from the lake rushed down the South Fork, carrying with it much of the debris of the dam. At the village of South Fork it turned with the stream, and, after inundating the village, by a return wave carried much of it away. With a continually increasing burden of wreckage it went down the Little Conemaugh toward Johnstown. At Conemaugh it struck the Pennsylvania railroad's round house. It destroyed it and scattered the engines in all directions. Near this point it also carried away the day express which was standing there unable to proceed or retreat on account of the condition of the tracks. A number of the engines from the round house were carried into the bed of the South Fork and left there covered with rock and material of all kinds. The channel was completely filled, and at present the stream goes through a new channel several hundred feet distant. Our cut gives the scene at this point. Houses in Conemaugh that formerly were back from the stream and cut off from sight of it by other houses, now stand upon the brink of the new channel. How the question of title to land will ever be settled cannot be seen. The diversion of the stream is undoubtedly a permanent change, and now it runs over what were once building lots in the town of Conemaugh.

The inhabitants of the settlements near the dam had obeyed Mr. Parke's warnings, and the loss of life there was slight. But Johnstown was already flooded, and the people, apparently too familiar with floods, and regarding them only as discomforts, paid no regard to the messages from the lake. The torrent poured down upon them through the Little Conemaugh. At Johnstown this stream bends at almost a right angle and is joined by the waters of Stony Creek. This is shown very clearly in the bird's-eye view of the region. The flood came in with irresistible power and did not follow the curve, but drove across the bend of the Little Conemaugh, and rushed over the flats through the heart of Johnstown until it met the swollen waters of Stony Creek. Here it went in two directions, backing up the creek as well as rushing down it. Just below the junction of the two streams is the stone railroad bridge. Up to this point the water had carried away every bridge it encountered. But the stone structure was too strong. It stood the strain and at once the immense mass of debris piled up against it. The water was thus held back in Johnstown as if in a shallow basin. It formed a gigantic whirlpool and began circling around the valley, completing the work of destruction. On the first overflow it had swept through the city and carried a mass of houses and wreckage into Kernville. When all was over, Kernville was left full of the Johnstown buildings, and to-day it may be said that every lot in Kernville has one or more houses on it that once stood on the opposite side of Stony Creek. In the region of the center of the whirlpool, some structures were left nearly intact.

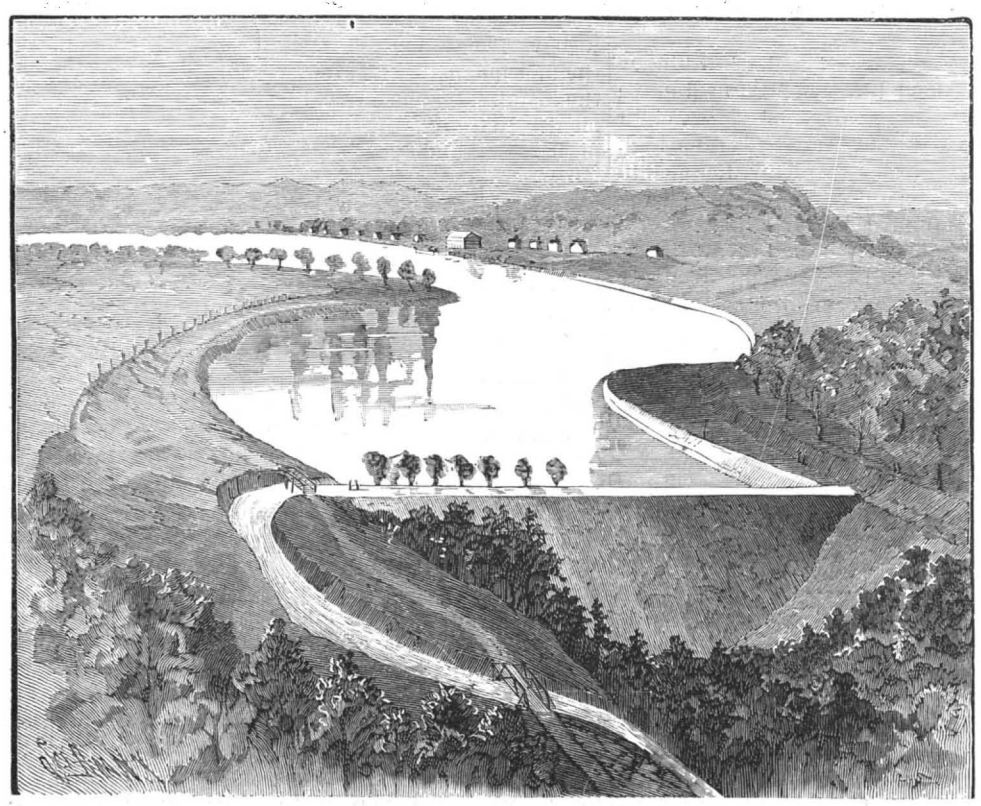
The water in its passage from the lake to Johnstown descended about 250 feet. The theoretical velocity due to this descent would be about 127 feet per second, or between 86 and 87 miles an hour. According to the best accounts that we have, from 15 to 17 minutes was occu-



CROSS SECTION OF THE DAM.



MASONRY WORK AT THE OUTLET BENEATH THE DAM.



SOUTH FORK LAKE BEFORE THE DESTRUCTION OF THE DAM.

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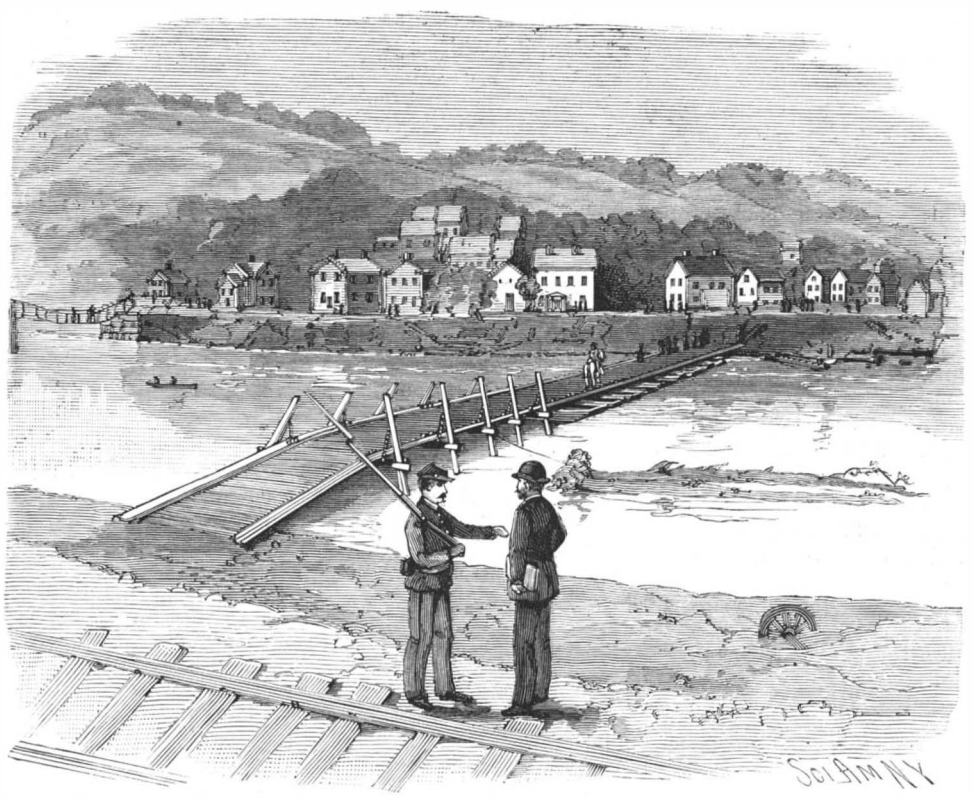
pied in the passage to Johnstown, a distance of about 12 miles. Thus the average velocity could not have been far short of 50 miles an hour. The impetus of such a mass of water was irresistible. As the flood burst through the dam, it cut trees away as if they were stalks of mullein.

The region surrounding Johnstown has a large lumber interest, and many saw logs found their way into the torrent, principally coming from the country near Stony Creek. These added to the strength of the blockade at the bridge. For several days a number of stationary steam engines have been at work dragging the larger pieces of wood and wreckage out of the dam, in order to give a clear passage to the water and to remove the remains of human beings and animals that, decaying, may yet give rise to sickness.

The most widespread movement for relief has naturally taken place. Contributions of all kinds as well as money have been liberally donated. After various vicissitudes in the way of government, wherein the military and civic authorities tended to come in conflict with each other, the region has been placed under martial law, with Adjutant-General Hastings in command.

From West Point and Willets Point pontoon equipments were dispatched, and temporary bridges of this description were erected where required. Over one place a suspension bridge has been built. A quantity of tents have been pitched, and many of the features of army life are to be seen. A view is given illustrating these aspects of the scene, and showing the Willets Point pontoon bridge. The loss of life is quite uncertain. A bureau of registration has been established for the survivors, and a total of about 16,000 individuals are represented on its pages. About 1,200 bodies, over half of which were identified, have been recovered. It is proposed to compare the statistics collected with the most recently compiled directory of Johnstown, and thus arrive at a better estimate of the loss.

As stated in our previous issue, the damage to life and property by the storm was not confined to the Conemaugh region. On the other slope of the Allegheny mountains floods and inundations occurred, sweeping millions of feet of logs down to the Chesapeake and out to sea. As a bounty is allowed for the saving of such logs, a considerable portion will be secured, but many are now afloat far out on the ocean. A captain of a schooner describes being caught among them, and gives a graphic account of the trouble he had in escaping.



TEMPORARY BRIDGES OVER STONY CREEK.

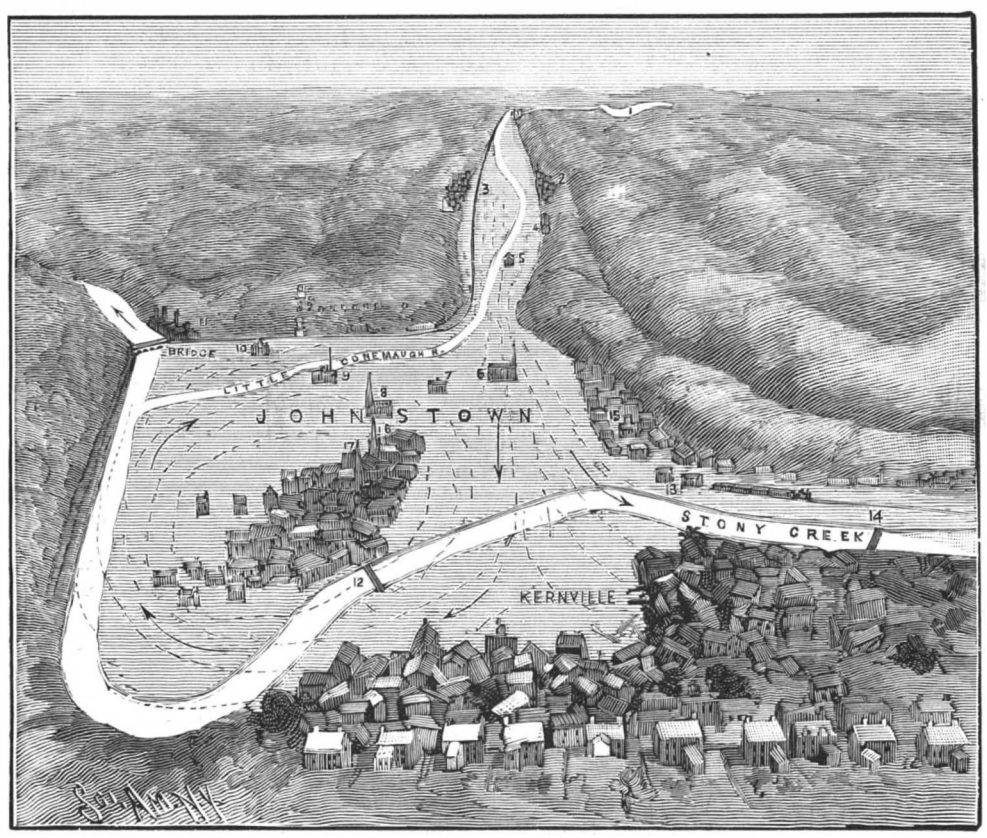
Ocean Currents.

At the recent conversazione of the Royal Society a model illustrating the formation of ocean currents was exhibited by Mr. A. W. Clayden. This is practically a map of the Atlantic in which the land surfaces are raised about half an inch above the portions occupied by the sea. The continents and larger islands are made of wood cut into the required shape, while the smaller islands are represented by pins or small pieces of sheet metal driven into the board which forms the basis of the whole.

This raised map forms the bottom of a shallow tray, which can be filled with water up to the level of the land surfaces, thereby obtaining a map (on Mercator's projection) in which the seas are represented by the surface of water. Underneath the tray a wind chest is fixed, and a number of tubes are brought up from it through the continents, and bent over so that the jets of air delivered from them may impinge upon the water. These jets are so arranged as to approximately reproduce on a small scale the actual circulation of the atmosphere as laid down on a chart of the prevalent winds for the year. Care is taken to have as few tubes as possible, and they are so placed as to hide the least possible amount of the sea. The strong and persistent trades are simulated by bringing the openings of the tubes near to the surface of the water, while the fitful and uncertain winds of northern latitudes are imitated by allowing the jet to be considerably dispersed before coming into contact with the water. A foot blower is attached to supply the wind, and any movement of the water is rendered visible by scattering over it some lycopodium powder.

All the principal currents of the North Atlantic are shown, including the return current between the great equatorial currents, and the northward stream along the west coast of Greenland. If a narrow opening is made in the Isthmus of Panama all that happens is that some of the return stream round the Mosquito Bay and Gulf of Darien flows into the Pacific, leaving the North Atlantic practically unaffected. But if a large part of Central America is removed, almost the whole of the tropical water passes through the opening, and the currents from Baffin's Bay and the Arctic Ocean are drawn down to the Azores.

There is an absence of evident connection between the slack water close to the New England coasts and the Labrador current, but the apparatus does not attempt to imitate differences of temperature or differences of rotational velocity. Hence any effect due to either of those causes must necessarily be absent. All that is attempted is to demonstrate the connection between the prevalent winds and general oceanic circulation, by showing that nearly all the movements of the water are determined by the direction of the winds and the contours of the coasts.



1. The Reservoir and Dam. 2. Conemaugh or Franklinboro. 3. East Conemaugh and buried locomotives. 4. Chemical works. 5. Grist mill. 6. German Catholic Church. 7. B. & O. R.R. Depot. 8. Methodist Church. 9. Cambria Co.'s Stores. 10. School House. 11. Cambria Iron Works. 12. West Point Pontoon. 13. Temporary B. & O. R.R. Depot. 14. Willets Point Pontoon. 15. School House Morgue. 16. Lutheran Church. 17. Baptist Church.

BIRD'S-EYE VIEW OF CONEMAUGH VALLEY AND JOHNSTOWN.

Communication of Infection.

From the number of cases reported of infectious diseases that have been communicated through articles that have been in the possession of those afflicted with such diseases, it would seem that greater attention should be given this matter. The virulence of many disease germs has been shown, says the *Sanitary News*, to be of long life, capable of being transmitted through many years. Cases of scarlet fever, diphtheria, and typhoid fever have been reported in which the infection was communicated by articles that had been possessed by the sick years before.

In cases of small pox and yellow fever, infection by this means is considered well enough founded and dangerous enough to make the destruction of clothing and all articles exposed to infection imperative by a general law of health departments. If such articles are not burned, they must be subjected to disinfection by steam at a high temperature.

Our public and circulating libraries, "second-hand" book, clothing, furniture, and other stores, are all means by which disease germs could be communicated. Dealing in "second-hand" goods has grown to such an extent that almost all communities have representatives in their midst. Goods may be on the tables of the "second-hand" dealer or broker which could have hung in the room of one afflicted with some infectious disease for weeks, and no one who may want to purchase, or even the dealer himself, know of it. Or there may be the furniture, or even the bed and bedding on which the patient lay.

Probably the most danger lies in books. With most patients there is a time in their sickness when they want books with which to pass the hours of convalescence. The home library seldom is sufficient, and the public or circulating library is resorted to. The book goes from the patient's into another's hands, bearing all the seeds of disease of which it is capable. Either there is danger of communicating disease in this way, or the germ theory is a failure.

This matter has been deemed of such importance that in many European countries extensive investigations are being made regarding the infectiousness of books handled by the sick. The investigation should extend to all "second-hand" goods, and be conducted with great care and minuteness. In commenting on this subject, the editor of the *Christiania* (Norway) *Sanitary Journal* gives the following personal experience, which is but one of similar cases reported:

In 1846 an eight-year brother of my wife was taken down with scarlet fever and died. During his illness he frequently amused himself by looking over a large picture book. This, together with several other of his useful playthings, was packed away in a chest after his death. Twenty-six years afterward, in 1872, a sister-in-law of mine journeyed across the channel to England, where I was then residing, and with her came the chest and the picture book. On the second day the chest was opened and the book presented to my two-year old son. Within the next two weeks the little fellow was taken down with scarlet fever. The doctors who were called in consultation wondered how the disease was contracted, as there had been no scarlet fever in the town for years. The circumstances of the book were called to mind, and the indications were clearly that the twenty-six year old book had retained the poison and communicated it to the child.

Had not this book been mentioned and its history given, here would have been a case of "spontaneous" scarlet fever. Phthisis is said to be communicated by sweepings from carpets in the rooms occupied by such patients, yet "second-hand" carpets are not only placed on sale, but hung out of store windows and displayed on the sidewalks, and no one knows how contaminated they may be from the expectorations of the consumptive.

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PHOTOGRAPHIC NOTES.

Negatives Developed during Exposure.—M. Tondeur has again shown negatives developed during the camera exposure. He contents himself, in order to obtain this result, with immersing the plate in hydroquinone developer and draining it, then he exposes it in the camera. If the time of exposure is sufficiently long, the development is completed simultaneously; if, on the other hand, the negative has been taken instantaneously, it must be left the necessary time for development. What escapes us for the moment is the practical application to be made of this method of action. However this may be, it is well to take notice of everything fresh, the question of application being one ulterior to that of the possibilities that may be in store.—*Leon Vidal, in the Photo. News.*

Apparatus for Automatic Photography.—Mr. Enjalbert, who has already furnished proofs of his ingenuity in contrivances, has worked out a very curious automatic apparatus, in which all the operations are mechanically effected by an electromotive engine. This apparatus is prepared for the Paris exhibition, where it will be seen in work; but we have been favored with an opportunity for inspecting it and seeing it in action. It is certainly a marvel of ingenuity. The apparatus is started by placing a 10 centime piece in it, and the subject having placed himself in the prescribed place, a ferrotype plate is coated with collodion, bathed, and adjusted to the focus of the lens, when the exposure is made. It is then led into a developing solution, fixed, and washed, and in a very short space of time the portrait comes out of an opening in the machine, accompanied by a small frame in which to place it. The ingenuity required to work out all these operations automatically is truly astonishing.

Photographing on Wood.—The following method, taken from the *Revue Photographique* (translated in the *Photographisches Archiv*), can be recommended as a good one: 8 grammes of gelatine are soaked in 500 c. c. of water, dissolved on a water bath, and 8 grammes of white soap are added to it gradually, well stirring all the time. The mixture is filtered through muslin, a little zinc white added to it, and then rubbed well into the wood block and allowed to dry. The film should be as thin and even as possible. When dried, the following solution is applied to the wood by the aid of a broad brush:

Albumen	30	grammes.
Chloride of ammonia	1·2	"
Citric acid	0·2	"
Water	24	c. c.

The albumen is beaten up to a froth, allowed to settle, and then is added the water, the chloride of ammonia, and the citric acid, exactly in order given here. When dry the film should be sensitized by pouring on the following solution, spreading it with a glass rod:

Nitrate of silver	3·2	grammes.
Water	31	c. c.

The excess of this sensitizing solution is poured off and allowed to dry again. Printing is effected as usual in the printing frame. It is not necessary to overprint. When sufficiently printed, the wood block is held with its surface for three minutes in a diluted solution of common salt. The print will become only slightly paler in it. Wash and fix for four or five minutes in a concentrated hypo. solution, wash again for ten minutes in running water, and allow to dry.

Photography Applied to the Prediction of the Weather.—With regard to the accident which has occurred to the German navy at Apia, it might be advisable to refer once more to the theory of Dr. Zenger, of Prague, who suggested, as it will be remembered, to make use of photography for the prediction of the weather. According to the doctor, photographs of the sun taken on orthochromatic plates offer a most infallible means to indicate with almost absolute certainty the approaching atmospheric and subterranean disturbances at least twenty-four hours before their setting in. In these photographs zones are often to be seen around the sun's disk—*i. e.*, rings of circular or elliptical form, of white or grayish color—and if these zones appear of very large diameter, and of unusual heaviness, this indicates that violent storms, thunderstorms, or magnetical disturbances will soon set in at the place of observation. At every ships' station should therefore be established a small photographic laboratory, in which photographs of the sun could be taken as often as possible. A much more reliable prediction of the weather would be afforded by this means than by the aid of the barometer now generally in use for this purpose, and precautions could therefore be taken in good time.—*H. E. Gunther, in Photo. News.*

THE English are contemplating an idea to lay down a postal tube between Dover and Calais. The plan is to suspend two tubes of about a yard each in diameter by means of steel cables across the channel, forty yards above the level of the sea. The steel cables will be fixed to pillars at distances of about 800 yards, and in each tube a little railway will run with cars capable of carrying 450 pounds in weight. No parcel of greater weight than this will be taken, and the cost is estimated at the modest figure of $5,000,000.

About Melons.

Years ago it was a common practice to plant melons, literally, in "hills" raised above the surface of the ground, and some still think such a practice necessary. When the seed is sown early there may be some advantage in this, since the elevation will be warmer than the flat surface. But, as a rule, in soil best suited for melons—a warm, sandy loam—a more thrifty growth and more prolonged health of the vine can be secured by making the hills really hollows. Nothing so promotes the growth of a melon vine as the drawing of fresh earth to the stem, and a vine planted a few inches lower than the general surface of the soil, by a gradual drawing-in of the soil by the time cultivation ceases can be on quite a ridge, and thus get the advantage of the hill with the further advantage of having its roots in moister and cooler soil than would have been possible if planted on a ridge. These remarks will apply equally well to watermelons as to muskmelons.

In growing melons for home use quality is the first consideration. Of late years the effort among seedsmen has been to produce a watermelon with a tough rind, adapted to the long shipment from the South. This has been obtained at the expense of quality. In our home garden it is of no sort of advantage to raise a watermelon which will support a weight of half a ton, as some are said to do. Neither do we care for its being "iron clad" or "copper fastened," unless the inside is well worthy of such protection. The newer sorts of watermelons, while they have been improved for the purposes of the shipper, have not been of the average quality of some of the older sorts. We have found none superior for this region to the "Gypsey" and the "Mountain Sweet." The "Volga" is said to be small and of high quality, but we are growing it for the first time this year and cannot give an opinion upon it. In muskmelons it is also a good rule to select varieties, not by size and looks, but by their quality for the table. In muskmelons size is often attained at the expense of quality. Many contrivances have been proposed for protecting young melon seedlings from the attacks of the striped bugs, which devour them when in the seed leaf, but most of them are very troublesome. For many years I have used a little raw bone-flour, dusted over the young plants as soon as they are fairly up. If beetles are there they leave at once, and the plants are benefited by the application.

Early fruitfulness is promoted by nipping off the tips of the vines when about three feet long.—*W. F. Massey, Garden and Forest.*

Government Schools in China.

In 1885, after peace had been declared between France and China, the viceroy, Li Hung Chang, obtained the imperial sanction for opening military and naval schools at Tien-Tsin, where Chinese pupils could receive instruction in western sciences. The military school has been in operation five years, has 150 pupils, and one class has already graduated. It has four German professors, and the instruction is entirely in the German and Chinese languages.

The naval school is divided into two departments—the executive, for the training of naval officers, and the engineering, for the training of engineers. The number of pupils is 120, selected from the different provinces of the empire, and the length of the course is five years. The director of studies is Mr. Yen Tsung Kwang, who is assisted by three English professors, two of whom belong to the English navy. Mr. Yen Tsung Kwang is a graduate of the foreign school at Foo-Chow, who, after seeing service afloat, was sent to the royal naval school at Greenwich, where he graduated with high honors. The remarkable proficiency of the pupils of the naval school, as shown at the public examinations, reflects the highest credit upon Mr. Yen Tsung Kwang and his associates. These examinations are conducted much in the same way as at West Point and Annapolis, and the subjects embrace all the higher branches of mathematics, the difficult problems of which the Chinese mind is said to master with extraordinary facility.

A school for instruction in telegraphy was organized in 1880, and at present has 48 pupils. The instructors in this school are Danes, but the instruction is given in the English language.

A local medical school, with a hospital attached, was founded some years ago by the viceroy. This school is now about to be reorganized with an eminent foreign doctor at its head, the object being to qualify young men for the medical profession and attach them to the army and navy, as well as other branches of the public service.

In addition to the schools already mentioned, an Anglo-Chinese college will be opened early in the year 1889. The building for this college was commenced in 1887 and is now nearly completed. It is a fine Gothic structure, situated on the left bank of the Peiho, and has accommodations for 300 students. The organization of this college is not yet complete, but it is understood that the curriculum will be more extended than at any of the other schools, and will include a general course of study in the English language and literature, as well as in mathematics and the sciences. It is reported that Mr. C. D. Tenney, an American, now the private tutor of the viceroy's children, will be placed at the head of this college.

When it is considered that hitherto the officers in the Chinese army and navy below the rank of general and admiral have been taken from the uneducated classes, and have obtained their commissions often by purchase, and that both branches of this service have been without a medical staff, the importance of the educational establishments at Tien-Tsin, promoted and fostered by the viceroy, cannot be overestimated.—*Report of Consul Smithers.*

Purdue University.

Purdue University, at Lafayette, Ind., is a State institution. It is supported by legislative appropriations and by the proceeds of an endowment fund granted by the general government. It derives its name through legislative enactment from John Purdue, who gave to the State for the use of the institution $150,000. It has a permanent endowment fund to the amount of $340,000, and other non-productive property in buildings, lands, and equipment to the value of $330,000.

It has one hundred and eighty acres of land in its campus and farm, fifteen buildings, well equipped laboratories, shops, museums, library, and reading rooms.

Its purpose is to afford young men and women of Indiana an opportunity to acquire a good collegiate education in mathematics, science, literature, and art, and at the same time to secure instruction and practice in such lines of work as will fit them to engage in the practical industries of life. The instruction is both theoretical and practical. The usual methods of text book study, recitation, and lecture are employed, but the student is required to put into practice as far as possible the instruction which he receives. He, for example, not only receives instruction in regard to the theory and principles of drawing, pattern making, and machine construction, but he is required to make working drawings himself, to construct patterns, to make the castings in the foundry, to finish and set up the machine, and to operate it when it is completed. This combination of the theoretical and the practical characterizes the institution.

Being a State institution, the instruction in Purdue University is free to all residents of Indiana of suitable age and acquirements. Small laboratory, library, and incidental fees only are charged.

The institution embraces seven special schools and a preparatory department, as follows: A school of agriculture, horticulture, and veterinary science; a school of mechanical engineering; a school of civil engineering; a school of electrical engineering; a school of science; a school of industrial art; a school of pharmacy.

How to Increase your Wages.

Every thinker knows that the man who would succeed must do more work than he gets paid for, in every profession and trade. We take it for granted that the man who will do only $20 worth of work a week because his salary is but $20 will never get more than $20 a week, for the simple reason that he has never shown his employer that he is worth more. We figure it that an employe who means to succeed has to do from 10 to 20 per cent more work than he gets actual pay for. This he has to do until he reaches a certain point, and having reached that point he will find that by as much as his income has increased, by so much has the demand for amount and intensity of his labor diminished. To put this theory into figures, we will say that a boy receiving $3 a week should do $4 worth of work; the boy receiving $5 a week should do $7 worth of work; when he gets to be a man and receives $20 a week, he should do $30 worth of work; a man receiving $30 should do $40 worth of work, and so on until, say, the salary reaches $75, and then the laborer can give himself somewhat of a rest, that is to say, about $50 worth of work will satisfy his employer. Labor brings its market value, and is seldom overpaid, oftener underpaid. It is the experience—the "Know How"—that brings the money.—*Philadelphia Ledger.*

THE center of bulb culture in Holland, says *Gartenflora*, is still at Haarlem, as it has been during two centuries and a half. Hyacinths are especially in favor just now, and ground suitable for their cultivation has sold for as much as $13,500 an acre, as against about $1,000 given for land of other kinds. The expense of cultivation is placed at about $300 an acre for hyacinths and $160 for tulips; and it is noted that artificial manures are never used. Narcissus is also grown in vast quantities near Haarlem, chiefly for exportation to England. Formerly the export trade in cut flowers was enormous, one Haarlem firm having exported in a single season 10,000 cases; but an agreement was last year entered into by a majority of the Dutch florists to abandon the sale of cut flowers as competing with the interests of purchasers of bulbs. Attempts have been made to extract the perfume of hyacinths, but only with moderate success, especially from the commercial point of view.

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Standard Water Pipes.

At the meeting of the American Water Works Association, recently held at Louisville, Mr. S. B. Russell read a short paper on standard water pipes. At present the consumer orders pipes of the desired diameter and thickness. The manufacturer chooses the pattern nearest to this diameter, and calculates a core to give the required weight, but rarely gets the exact internal diameter. This results in considerable annoyance and some loss to the consumer. In America there are 14 sizes of 6 inch pipe, between 27 lb. and 33 lb. weight per foot; and still they scarcely keep within limits of 2½ to 5 per cent variation in the weight. Wrought iron and lead pipes do not vary so much. Mr. Russell thought the Association were eminently fitted to improve the present condition of affairs, and any plan approved by them would, he said, probably come into general use. The standard series should fix the number of classes, five or six weights for each size. The weights per foot must also be fixed; and the uniformity of pattern (one of which might suffice for each size) would then greatly simplify the joint question. In St. Louis there are four classes of 30 inch, and two classes of other size of pipe, and only one pattern for each diameter.

The Antiquity of Bronze.

According to an analysis made by Professor Berthelot, the scepter of Pepi I., an Egyptian king of the Sixth Dynasty, consists of almost pure copper. The scepter in question belongs to the British Museum, and, as a special favor to Minister Waddington, the Museum authorities consented to give a portion of the precious object to be submitted to Professor Berthelot for analysis. Some filings from the inside—the scepter is hollow—weighing less than ½ grain, or exactly 0·0248 gramme, were detached for examination. The Professor has found them to consist of a reddish metal, slightly oxidized, and a quantitative analysis, correct within one-tenth of a milligramme, has proved the substance to be pure copper, without any admixture of tin, and doubtful traces of lead. His conclusions are that, since archæologists agree in placing Pepi's reign at about 4,000 years before the Christian era, the introduction of bronze, both in the Old World and in America, occurred very nearly at the same period, and at an epoch not much farther back than fifty or sixty centuries from the present time.

UNIVERSAL HAND LATHE.

The accompanying cut shows a new hand lathe which has just been placed on the market by the Brown & Sharpe Manufacturing Company, of Providence, R. I.

As shown in the cut, it rests upon a table; but it is frequently used as a bench lathe, and is furnished without the table. To prevent the bed from being sprung or twisted when the lathe is set, there is a pin in the top of one of the legs, which allows it to swivel sufficiently to compensate for any slight unevenness of the floor or bench. The other leg is firmly secured to the bed.

The top of the bed is flat, and is scraped to surface plate. It affords a bearing over its entire width for the foot stock and slide or other rests. The bearing surfaces of these are also scraped.

The foot stock is fastened to the bed by a clamp screw, and can be easily shifted or taken from the bed. Its spindle moves in a steel bushing, and is operated by a hand lever which has its fulcrum on an adjustable stud back of the spindle. This spindle may be clamped in any position, and has a movable stop, which serves to limit the forward motion when brought against the adjustable stop screw.

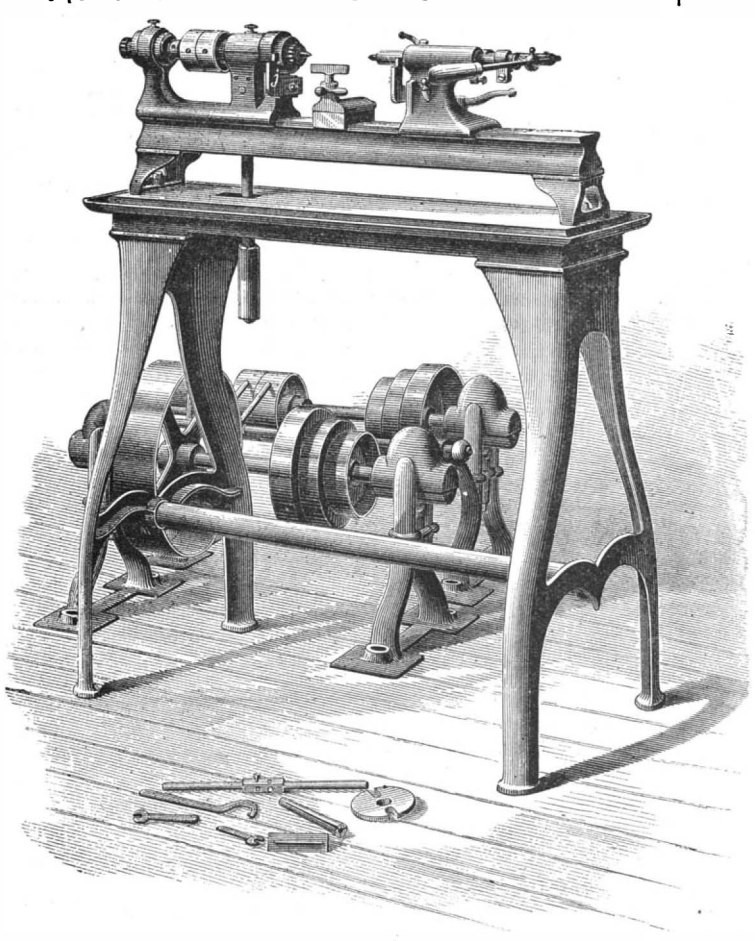
The spindle and boxes of the head stock are steel, hardened and fitted by grinding. The hole through the spindle is one-half inch in diameter the greater part of its length, and tapers at the front to three-fourths of an inch in diameter. The spindle bearings are thoroughly protected from grit and dust and are lubricated from beneath.

The tool holder guides on the head and foot stock may be set in or out, and enable the lathe to be used for turning small shafts, studs, screws, etc., either straight or taper.

The overhead works consist of two countershafts. The first has tight and loose pulleys, 6 inches in diameter, 2½ inches face, also a three-step cone pulley. The second has a corresponding cone pulley and a driving pulley. The hangers have adjustable and self-oiling boxes.

The lathe swings 9 inches over bed and receives 14 inches between centers. The weight of the lathe complete, ready for shipment, is about 500 pounds. The usual accessories are furnished.

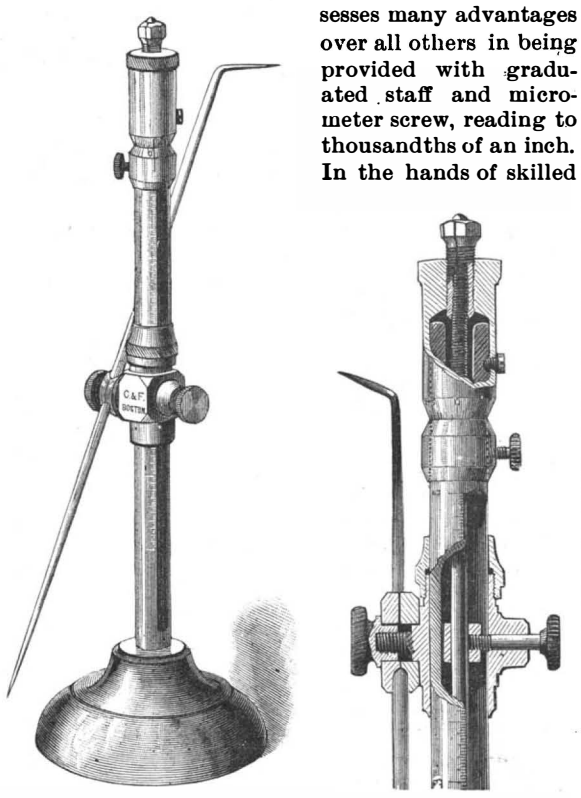
The Brown & Sharpe Manufacturing Company has just issued a very fully illustrated pamphlet on the construction and use of the hand lathe, which they will be pleased to forward on application.



UNIVERSAL HAND LATHE.

NEW MICRO-SURFACE GAUGE.

The annexed illustrations represent a new tool for obtaining fine measurements on the planer or surface plate. In general appearance it is not unlike the ordinary gauge used for that purpose. It, however, possesses many advantages over all others in being provided with graduated staff and micrometer screw, reading to thousandths of an inch. In the hands of skilled workmen this tool is capable of the finest adjustment. The staff is milled out to receive a steel rod, passing through its entire length, and is graduated for a distance of five inches. The slide, carrying the pointer, is connected to the central rod by means of a clamping screw, that allows it to be moved instantly and held firmly in any position.



MICROMETER SURFACE GAUGE.

The rod is threaded at the top for a distance of one inch to correspond with the internal thread of the cap. The latter revolves on the staff, and each revolution moves the slide or pointer carrier twenty-five one-thousandths of an inch up or down.

The pointer is held between clamping collars, and revolves with them to any position around their axis, and it may be moved from end to end through the collars. A milled thumb nut secures the pointer in any position in which it may be placed.

The measurement is obtained by first setting the pointer roughly, as in all ordinary surface gauges, the fine adjustment being effected by turning the cap. A movable collar on the slide is then brought up to the proper graduation for beginning, and a similar collar on the staff is made to coincide with the cap, 0 to 0. This first measurement may be taken from the surface the tool rests on, or from any test block or scale, and carried anywhere from that to the extreme height of pointer at its greatest elevation, which is about 12 inches with the one furnished. Longer pointers may be substituted, thus making the capacity of the gauge practically without limit.

This tool is the invention of Mr. Edgar Smith. It is made by Chandler & Farquhar, 177 Washington Street, Boston, Mass., who may be addressed for further information.

Telephone Vibrations Made Visible.

At a recent meeting of the Physical Society, Berlin, Dr. Frohlich made a further communication in connection with his older, resultless experiments on the objective demonstration of the vibrations of a telephone disk, in order to describe his new method by which positive results had been obtained. In his earlier experiments he employed manometric flames, and endeavored to photograph their movements with the help of a rotating mirror; now, however, he attaches a small mirror to the iron plate of the telephone, and from this the light of an electric lamp is reflected on to a polygonal rotating mirror, from which it falls upon a screen. The vibrations of the plate were thus made visible on the screen, and since each side of the polygonal mirror cast its own image, when the mirror was rotated the curves were seen moving over the screen. The more rapidly the mirror was rotated the slower did the curves move over the screen, and when the rotation was as rapid as the vibration of the plate, the curves became stationary and could thus be exactly observed and drawn. These luminous curves could also be photographed. The speaker had employed this method in a series of researches on certain electrical phenomena which might influence the efficiency of the telephone. Thus the action of alternating currents, of self-induction, of the rise and fall of the current on making and breaking, of the introduction of electromagnets, and of other conditions, were studied by means of the altered mode of vibration of the telephone plate. The speaker had further obtained a graphic record of the vibrations of the telephone plate when vowels and consonants are sung and spoken into it. Many other problems may, by the above method, be brought nearer to their solution.

The International Congress of Medical Jurisprudence.

The above congress commenced their session for the year 1889 on June 4, at Steinway Hall, in this city. It closed on June 7. The officers elected included Dr. Clark Bell as president, with Prof. John J. Reese, of Pennsylvania, ex-Judge Noah Davis, of New York, and a number of eminent physicians and others as vice-presidents and secretaries. A paper by Prof. R. Ogden Doremus on the "Marsh Test for Arsenic" brought out an interesting discussion. A man was charged with poisoning his wife, but immediately after her death the undertaker had as a preservative injected the body with an arsenical solution. It was agreed that in such a case no distinction could be drawn between the fatal arsenic and that of the embalming solution. Other subjects discussed during the meeting touched upon the degree of responsibility for crime. "Alcoholism, Inebriety, and Suicide," and the subject of "Insanity and Responsibility," including the topic of the innocent insane, and the necessity for their treatment in separate institutions or divisions from the criminal insane, were the subjects of papers and discussions. Toward the close of the session the subject of electricity as the mode of inflicting the death penalty was spoken of. The city institutions for the insane were inspected, and after some social features, including a dinner, the session adjourned.

Painting Floors.

A French writer observes that painting floors with any color containing white lead is injurious, as it renders the wood soft and less capable of wear. Other paints without white lead, such as ocher, raw umber, or sienna, are not injurious, and can be used with advantage. Varnish made of drying lead salts is also said to be destructive, and it is recommended that the borate of manganese should be used to dispose the varnish to dry. A recipe for a good floor varnish is given as follows: Take two pounds of pure white borate of manganese, finely powdered, and add it little by little to a saucepan containing ten pounds of linseed oil, which is to be well stirred and raised to a temperature of 360° Fahr. Heat 100 pounds of linseed oil in a boiler till ebullition takes place, then add to it the first liquid, increase the heat and allow it to boil for twenty minutes. Then remove from the fire and filter the solution through cotton cloth. The varnish is then ready for use, two coats of which may be used, with a final coat of shellac, if a fine polish is required.

The New Explosive.

A correspondent calls our attention to an error of spelling. Grisoutite is correct. The spelling grisontite was a typographical error.

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RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER FEEDER. — Albert F. Jones, Salem, Mass. This invention covers a novel combination and arrangement of parts in a simple form of boiler feeder, designed to be effective and automatic in operation, while at all times keeping the water level in the boiler at the desired height.

GAS WASHER. — Joseph De Brouwer, Bruges, Belgium. This invention relates to apparatus for purifying gas used for heating and illuminating purposes, providing a single machine, essentially after the pattern of a turbine, whereby the gas may be exhausted from the retorts, cleared of all its impurities, condensed and properly carbureted and prepared for consumption, the invention covering various novel features of construction and arrangement of parts.

SMOKE CONSUMER.—James C. Butler, Quincy, Ill. This invention covers a construction whereby steam taken by a pipe from the dome of the boiler is carried immediately below the grate, and superheated and introduced into the furnace just in advance of the bridge wall, causing a combustion designed to be so perfect that there can be no accumulation of soot, and the gases will all be consumed.

Railway Appliances.

RAIL FASTENER. — Charles Netter, New York City. Bolts project upward through the tie at each side of the rail flange, each bolt having a transverse slot for the reception of a key which bears on the rail flange at one end, the other end of the key being secured to the tie by a locking bolt or an ordinary screw bolt.

CAR STARTER. — Gustav Schmidt, Rheine, Prussia, Germany. This is a form of pinch bar, with a lever handle and a plate extension of the base to place under the rim of the car wheel, there being mounted in an opening in the base a grooved roller having flanges with ratchet teeth, the roller being adapted to fit over the crown of the rail, while a pawl prevents the roller from revolving backward when the load is heavy or the rails wet.

CABLE GRIP. — Charles S. Chapman, Kansas City, Mo. The grip heads are connected to a fixed frame, a movable frame being arranged for connection with the toggles of the grip, and a link pivoted in the movable frame, while a crank is pivoted in the fixed frame and pivotally connected to the lower end of the link, a lever being mounted upon the pivots of the crank, the parts being readily adjustable as they become worn.

STATION INDICATOR.—Victor L. Cunnyngham, No. 3 East Swan St., Buffalo N. Y. A casing is provided containing cards bearing the names of stations, the cards being arranged to be moved forward by an endless belt, with an escapement for allowing them to be dropped out of sight, and devices for operating the belt and escapement, so that a series of indicators may be placed on the different cars of a train and operated simultaneously by the conductor or engineer.

Mechanical.

SAW SWAGING MACHINE.—Thomas B. Hite, Seattle, Washington Ter. The construction of this machine is such that the entire device may be fastened to a wall or bracket, while the saw to be operated on is suspended in proper position by a rope or other means, the invention covering various novel parts and combinations in a machine designed to be simple and durable in construction and very effective in operation.

CLEANER FOR COTTON GIN SAWS.—John C. Godwin, Lloyd, Texas. This cleaner is placed directly below the saws, secured on a shaft mounted to rotate in the usual manner, and consists principally of a drum provided with radially arranged pairs of arms, forming forks, and adapted to press against the faces of the saws, to clean them while running, the arms being made of spring material, such as horn, whalebone, etc., about four pairs of arms being usually employed for one saw.

WATER WHEEL. — Lee Middleton, Clarksville, Mo. This water wheel is supported upon a vertical shaft between the top and bottom beams of a sliding frame moving in uprights in the mill race, the wheel being of novel construction, and being designed to be raised out of water when the operator desires to stop the rotary motion of the shaft.

Miscellaneous.

GAS BURNER AND HEATER.—Daniel S. Robilliard and Charles G. Davies, of Quebec, Canada. This is a burner designed for heating and cooking purposes, wherein an effective admission and expansion of gas and air is designed to be attained to give the best results from the least quantity of gas, the burner being held in suspension by a yoke within the stove opening or other desired place.

WINDOW.—Gustav J. Dolliner, Hamburg, Germany. Each of the casements, by this invention, is made with two separate points of rotation, the double hinges of the casements being so made that they descend when opened inward, the windows being adapted to be opened both inward and outward, while a tight connection will always be made between the window frame and the closed window casements.

FRAME FOR FANNING OUT PAPER.—James C. Oliver, Bergen Point, N. J. This invention covers a device to obviate the necessity of skilled labor in pushing out the edges of sheets, envelope blanks, or cards, designed to overlap sufficiently to leave a series of border spaces, and consists of a baseboard with longitudinal side strips and notched strips adjustable thereon, with other novel features.

RAZOR STROP.—George H. Coursen, Baltimore, Md. This strop consists of a rotatable wheel, made of wood sections glued or cemented together, each end of the wheel being somewhat in the shape of a truncated cone, the wheel having a circumferential jacket, one end of the jacketed wheel being covered with emery or other sharpening composition, while the other end is left plain.

TRUNK FIXTURE. — James B. Porter, Yarmouth, Nova Scotia, Canada. This is a lid or cover stay consisting of a spring plate with keeper, a segmental bar being secured to the lid and sliding between the keeper and the spring plate, whereby the lid, when carried upward to an open position, will be automatically locked to place.

WASHING TEXTILE FABRICS.—James S. Farmer, Salford, Lancaster County, England. This invention covers an apparatus consisting of rotating spider wheels, near the peripheries of the arms of which are mounted slotted or perforated hollow cylinders on the ends of links pivoted loosely to the disks or arms, for the better washing, cleansing, and treating of textile fabrics.

REFINISHING RUBBER BLANKETS. — Ferdinand H. Kogge, West Hoboken, N. J. This invention covers a method designed especially for use with rubber blankets of lithographic presses, by applying to the worn surface a composition consisting of varnish, gutta percha, white lead in oil, in specified proportions, allowing the material so applied to dry, and finally smoothing and polishing the surface.

BRAKE FOR DUMB WAITERS. — Hugh Donohoe, New York City. A brake wheel is secured on the shaft supporting the carriage pulley, and a second wheel held in line with the brake wheel, there being a pin with a wedge held between the two pulleys, a brake shoe engaging the brake wheel and supporting the pin, while a lever operates on the brake shoe, and weighted ropes are connected with the lever to counterbalance and operate it, affording a simple device for rapidly braking the main pulley.

SYRINGE. — Martin Overlach, Frankfort-on-the-Main, Germany. This is a glass syringe so constructed that it may be readily taken apart for cleaning, while the joints at the ends of the cylinders will be tight, the invention permitting the use of glass tubes having absolutely flat walls and no threads, while all the parts are exposed to view.

VETERINARY INSTRUMENT.—Benjamin Champlin, Cortland, Ill. This invention consists of a lance having a rounded head, with shoulders projecting beyond the sides of the lance, the instrument being for use mainly to effect a permanent remedy for hard milking in cows.

HORSE DETACHER. — John J. Peter, Campbellsville, Ky. This invention covers a novel construction and combination of parts whereby, at the will of the driver, the traces secured at their rear ends to the vehicle may be detached at their forward ends from the hames, and the backing strap may also, as the horse moves forward, be detached from the breeching.

EGG TRAY FOR INCUBATORS.—John W. Hile, Valley Falls, Kansas. The drawer has inclined surfaces on which the eggs are supported, in connection with a division board having egg-shaped openings into which the eggs are fitted and held in an inclined position, the division board sliding in the drawer to turn the eggs, whereby a larger percentage of eggs will hatch out chicks, in a stronger and healthier condition.

WICK RAISING ATTACHMENT.—Patrick J. Glynn, Highland, N. Y. This invention relates to lamps having a wick-raising gear mechanism, and provides an improved device so arranged that the burner may be readily taken off and put on, and the wick-raising gear mechanism properly adjusted, so that it may always be effectively operated.

COMBINATION LOCK.—Irvin A. Shaw, Kinsley, Kan. The sliding bolt has a longitudinal slot communicating with a circular opening, in connection with a shaft having a flat part received by the slot of a circular tumbler, whereby when the flat part and tumbler slot are perpendicular to the bolt slot the bolt will be locked, and when turned flatwise the bolt may be retracted, the tumbler sliding with the bolt, the operator being guided by the sound of a spring engaging a turning ratchet wheel.

CHECKREIN HOOK. — George W. Moliere, Ocean View, Cal. This invention consists of a checkrein hook with two parallel shanks, secured to the harness saddle by a screw passing through both shanks, there being no projection on the under side of the shank, so that when the saddle padding becomes compacted or worn, the back of the horse is not chafed.

REIN HOLDER.—William F. Turman, Weatherford, Texas. This is a device which may be attached to a vehicle by bolts or straps, as most convenient, in which to place the reins when a horse is left standing, or it may be utilized to hold an animal's head back when unruly, the reins being drawn back when possible, while the animal cannot draw them forward.

GRAB LINK FOR TRACE CHAINS. — Joseph E. Giroux, Alpena, Mich. This is a fastening for securing the chain in the gripping portion of the link so that there will be no danger of the chain slipping within the grab link, and when once adjusted it may be held securely, while in unhitching it is only necessary to detach the chain from the trace tug and let the chain hang on the whiffletree.

WATER HEATER.—Simon Spiro, Birmingham, Ala. This invention covers a novel form of fire pot to be placed in a vessel or receptacle containing the water to be heated, so that the heat given out will do its work most efficiently, while the fire pot will be held against displacement, and is convenient to carry by bails or handles.

GATE.—William C. Hooker, Abingdon, Ill. This invention covers an improvement on a former patented invention of the same inventor, providing a gate of simple and durable construction, which is locked automatically, and can be easily opened and closed from either side of the roadway.

TROUSERS STRETCHER. — David F. McNair, Wilkesbarre, Pa. This device consists essentially of two frames pivoted together, with clamp bars sliding therein, and wedge bars hinged to the frames, and a lock bolt, for retaining rigidly the top and bottom of a pair of trousers, and also adapted to be conveniently manipulated to stretch them and remove the bagging from the knees.

PERCOLATOR. — Thomas Boyce, New York City. The vessel for containing the menstruum and drug has a chamber in its bottom under the strainers, a suction tube leading down into the chamber and having a closure at its upper end, a discharge cock leading from the chamber, and a tube depending from the cock and having an upward bend at its lower end, the device being also adapted for use as a filter.

SELF-CLOSING HATCHWAY.—Frank J. Gridley, New York City. This invention relates to improved safety devices for elevator shafts, etc., whereby, should a fire happen in the building, the devices retaining the shaft doors will be released by the heat and the doors be permitted to automatically close, cutting off the draught up the shaft.

PHOTOGRAPHIC PLATES. — Walter S. Cullen, Kearney, N. J. This invention consists in an adjustable rack for washing and drying photographic negatives and positive plates, whereby the plates are securely held, and the rack is readily adjustable to different sized plates, while it may be folded for transportation and used by photographers in moving from place to place.

MAP EXHIBITOR.—William A. Taylor, Washington, D. C. This exhibitor is made in cabinet form to constitute a neat article of furniture, the sides of the casing having guides, outside of which weights are arranged, connected by cords with the maps, the edges of which are bound with sheet brass, to keep them from wear, the whole allowing of the ready exhibition of any one of a series of maps.

SCIENTIFIC AMERICAN

BUILDING EDITION.

JUNE NUMBER.—(No. 44.)

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1. Elegant plate in colors, showing elevation in perspective and floor plans of a field stone residence, costing about nine thousand five hundred dollars. Page of details, etc.
2. Plate in colors of a cottage costing three thousand two hundred dollars. Perspective elevation, floor plans and details.
3. Engraving of the new Federal building to be erected at Worcester, Mass. Cost two hundred and fifty thousand dollars.
4. A cottage of moderate cost lately erected at Bedford Park, New York. Perspective and floor plans.
5. Plans and perspective of a convenient stable erected at Bedford Park, N. Y.
6. A handsome residence lately erected at Chattanooga, Tenn., from designs by Blotherwick & Penn, architects. Cost ten thousand dollars complete. Plans and perspective elevation.
7. A residence at Florence, Northampton, Mass. Cost ten thousand dollars complete. Perspective and floor plans.
8. Engraving of a half-timbered house at Chester, England.
9. View and plans of a fine barn lately erected near Providence, R. I.
10. A modern residence at Belle Haven Park, Greenwich, Conn. Perspective and floor plans.
11. A handsome house in the colonial style lately erected at "Renolds Terrace," Orange, N. J., at a cost of fifteen thousand dollars complete. Chas. A. Gifford, of London, architect. Perspective elevation and floor plans.
12. A cottage at Bedford Park, New York. Cost eight thousand five hundred dollars. Plans and perspective.
13. Engravings of the great Eiffel tower at the French exhibition.
14. St. Cloud Prebyterian Church, Orange, N. J. Potter & Robertson, architects, New York. Perspective elevation and floor plan. Cost seven thousand five hundred dollars.
15. Miscellaneous Contents: Brick piers. — Home decorations.—Delights of color.—Foundations in alluvial deposits.—Portland cement and sea water. —The effect of moisture on wood.—The weeping larch, illustrated.—Nashville's estimating rules.—Selected lumber.—The science of dry rot.—Sewage a protection against the teredo.—Ornamenta borders, with illustrations.—Hot air *vs.* steam.—The new Catholic cathedral at Pekin.—Advantage of sanitary measures.—Which are the hardwoods? —An ideal living room.—A water motor for elevators, illustrated.—Granite rust. — Ventilating grates, illustrated. — French building laws. — Mahogany.—Artistic wood work, with illustrations.—Stains for mortar and plaster.—An enduring tin roof.—Wood filling and finishing.—Shell fish marbles.—Fire-resisting ceilings.

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Capitalists wanted to form stock company to introduce patent air ship. See Sci. Am., June 8, 1889. Address H. A. J. Rieckert, 134 Rivington St., New York.

For Sale—Patent floor cleaner. Simple, durable, and adapted to all floors. H. V. Shaw, Lawrenceburgh, Ind.

For the best Hoisting Engine for all kinds of work, address J. S. Mundy, Newark, N. J.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., 11 S. 9th St., Philadelphia, Pa.

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——*Ball Engine.*——

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The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Screw machines, milling machines, and drill presses. E. E. Garvin & Co., Laight and Canal Streets, New York.

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Billings' Patent Breech-loading Single Barrel Shotgun. Billings & Spencer Co., Hartford, Conn.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Safety Elevators, steam and belt power; quick and smooth. The D. Frisbie Co., 112 Liberty St., New York.

"How to Keep Boilers Clean." Send your address for free 96 p. book. Jas. C. Hotchkiss, 120 Liberty St., N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(944) N. G. B. asks: Is the No. 16 magnet wire used on the armature and field magnet double-covered and paraffined or the single-covered costing about 40 cents per pound? Does it make any difference if the layers of the field magnet do not lie close against each other, and the ends of the separate pieces abut? A. Single cotton-covered wire without paraffine is the kind used in the construction of the small motor. Double-covered would be preferable if there were room for it on the armature. The double-covered and paraffined you refer to is probably office wire, which will not answer. Irregular winding will make no serious difference in the power of the field magnet. The strips of which the field magnet is composed should lie as near together as possible, the ends being arranged to abut.

(945) C. W. S. asks: In increasing the size or linear dimensions one-half of the simple electric motor described in SUPPLEMENT 641, with what size magnet wire should I wind the armature and magnet coils to get the most power with bichromate battery? Would it answer to use a copper rim of proper dimensions for a commutator instead of screws? A. Wind the field magnet and the armature with wire of the size given in the article referred to, and place as many coils as possible on the armature. A copper rim divided into segments will answer.

(946) H. V. B. asks in reference to the phonograph described in SUPPLEMENT, No. 133: 1. Can the wax cylinder used at the present time be substituted for the tinfoil? A. It could if the recording point was of proper shape; as described it would probably answer, but a blunt point should be used for the

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reproduction of the message. 2. Can you give me any information as to the component parts of the wax used on these cylinders? A. No; it is not disclosed. 3. If not, kindly give directions for making a composition which will answer the same purpose. A. Try beeswax or paraffine wax mixed with spermaceti. 4. At what speed should the shaft which carries the cylinder revolve? A. About two revolutions per second. 5. Can the foil be replaced on the cylinder after being taken off when it has received the impressions of the needle? A. No. 6. How long should a cylinder last with careful handling? A. A wax cylinder can reproduce its message several hundred times.

(947) S. C. P. writes: 1. How long will the Eagle brand of condensed milk keep when the can is opened and but little taken out at a time? A. No period can be assigned; all depends on the atmospheric conditions, etc. Keep in the can upon the ice in a closed refrigerator. 2. Is there any danger of its being "chemicalized" when so opened? A. No; it will only turn sour and decompose. 3. Would it be better to empty the contents into a porcelain receptacle? A. No; do not attempt to transfer it. 4. How can I renew antique oak furniture that has been scratched by foreign substances and blistered by heat? A. Rub down to a surface with fine sand paper, smooth with ground pumice stone and water, varnish, and rub down with pumice stone and water. Repeat the varnishing and rubbing down process two or three times, finally varnish and polish with rotten stone and oil, and rub with olive oil and water on palm of hand. Use cloth scraps for the pumice and a piece of chamois for the rotten stone. 5. May coal oil be used on such furniture and a piano as a polish without injury to the articles? A. Use olive oil and water on the palm of the hand. Do not use coal oil.

(948) O. F. S. asks: How does a diamond compare with an electric light carbon as a conductor of electricity? A. The diamond is a very poor conductor of electricity, far inferior to the other forms of carbon. 2. What is the punishment for marking an article "patent" when the article has not been patented. A. The penalty by section 4901 of the patent laws is fixed at not less than one hundred dollars, with costs, half the penalty to go to the person who shall sue for the same, and the other to the use of the United States. It is to be recovered by suit in a United States district court.

(949) T. & Co. ask: Can you inform us if it would be practical to take pieces of tortoise shell and weld them together, by soaking the pieces of shell in hot water, then pressing them together? A. Provide a pair of tongs or pincers or tongs, file the point off to a feather edge, wet the surfaces and apply the pincers hot, following them with water. The tongs or pincers must not be too hot. Try them on paper, as you would curling irons for hair. The joint must be absolutely free from grease. This receipt is given by good authority.

(950) D. E. S. asks: 1. What is beeswax mixed with to make the wax to take a mould to electroplate? What parts of each? A. Melt 9 pounds beeswax and mix it with 1 pound Venice turpentine, and after mixture stir in 5 ounces of the best and finest plumbago and mix thoroughly. 2. Will a battery made from zinc, copper, blue vitriol, and rain water answer for a battery to electro-plate with? If not, what would be a good one? A. Yes; two or three such cells would answer. The Smee battery is excellent. For batteries we refer you to our SUPPLEMENT, Nos. 157, 158, 159. 3. Will the book on Electrotyping, by J. W. Urquhart, C.E., in your catalogue, be of any help to a beginner? Does it give the formula and treatment in plain terms of the process of electrotyping? A. The work is an excellent one, and is clear and simple in its treatment of the subject. Consult also our SUPPLEMENT, No. 310, for electroplating processes.

(951) H. W. B. asks: 1. Can you give me a formula for liquid to keep fruits, preserving their natural color, also for insects and fish, preserving their natural color? A. For natural objects in general use, alcohol. For insects no liquid, is needed, as they can be kept in the open air. 2. Best method of killing insects? A. Mix cyanide of potassium with plaster of Paris and water to consistency of cream and allow it to set in the bottom of a bottle, filling about one inch in depth. Keep corked. Put the insect when caught into the bottle, and it will soon die. 3. Manual for mounting objects for microscope and collecting of diatoms. A. We refer you to "Practical Microscopy," by Davis, $3, also Clarke's "Objects for the Microscope," $1.25. 4. What is your professional opinion on palmistry? Is there anything in it? A. There is absolutely nothing in it.

(952) C. M. W. asks: 1. Can the blowpipe furnace described in SCIENTIFIC AMERICAN, May 4, be made to burn gasoline instead of gas, as we have no gas here, and if so, how should it be used? A. The air blast should be blown through a tin or iron box containing gasoline. It will probably pick up enough in going over its surface to give a good flame. It can be made to work better by hanging cloths from top to bottom within the box. 2. How can I melt coin silver? A. In a crucible in a blacksmith's forge, using dried carbonate of soda, borax or common salt as a flux. 3. One steam horse power is equal to how many man power? A. Eight man power is equal to one horse power.

(953) G. T. G. asks: Is there any difference between one mile square and one square mile? A. One mile square denotes a rectangular area measuring one mile on each side. One square mile denotes the area of such a piece irrespective of its shape. Thus a piece of land one-half mile wide and two miles long would be one square mile in area, but would not be one mile square. The first expression denotes shape and size, the second size alone.

(954) G. T. writes: Do you know of any preparation that may be used for writing upon glass so that the writing will be etched upon the surface? I cannot coat the articles with varnish or wax and apply fluoric acid in the usual manner, and writing with the acid alone gives a blurred result. A. Equal parts of hydrofluoric acid, fluoride of ammonium, and dry precipitated sulphate of baryta are rubbed together in a porcelain mortar. They are then transferred to a lead, platinum, or gutta percha dish, and fuming hydrofluoric acid is added while the mixture is rapidly stirred with a gutta percha rod until it is of creamy consistency and the impression made by the rod quickly disappears. The sulphate of baryta is best made by precipitating chloride of barium solution with sulphuric acid, filtering, washing, and drying the precipitate at 248° Fah. Much depends on the quality of the sulphate of baryta. On no account let the hydrofluoric acid touch the skin, as it has the most serious effects. The compound is sold as "diamond ink," and should be purchasable in this city.

(955) T. W. asks: Will it take less hydrogen to run a gas engine than common gas? Will it take less hydrogen to run a steam engine than common gas. In both cases, in what proportion? A. It will take four or five times as much hydrogen measured by volume to produce the same quantity of mechanical energy as is produced by common gas, whether by the steam or gas engine.

(956) C. C. S. asks for a formula for making an ink eraser. A. Ink is erased by oxalic acid compounds, such as solution of the acid, pure or mixed with citric acid in equal parts. A stick of binoxalate of potash is sometimes used, which is rubbed over the spot previously moistened. Javelle water or other bleaching agents may be used. As a mechanical eraser India rubber with which ground pumice stone has been mixed before vulcanization can be used.

(957) W. C. H.—The sample sent is a clay rock containing pyrites, of no value as far as discernible.

(958) J. P. T. writes: 1. I have recently had a lightning conductor put on my house, composed of 49 strands of copper wire, and I am told it is not necessary to insulate where it is fastened to building. Is this so? A. Insulation is unnecessary. 2. Can you recommend a good treatise on sugar manufacturing plant, by means of diffusion, and also the roller system? A. We recommend Lock's "Sugar, or Hand Book for Planters and Refiners," price $10. This work treats the subject thoroughly and is an excellent work.

(959) Reader asks for a good hard negative varnish.

A. Shellac	1¼ oz.
Mastic	¼ "
Oil of turpentine	¼ "
Sandarac	1¼ "
Venice turpentine	¼ "
Camphor	10 grs.
Alcohol	20 fl. oz.

The varnish is applied by pouring on from the bottle, at one end of the plate, and then oscillating the plate from side to side and tilting it at the end until the whole surface is covered.

(960) H. W. R. asks how concentrated lye or potash is made, such as I find put up in tin boxes on the market. We burn in our furnace hickory dust, and the ashes are strong. This, for want of a market, we throw away. I would like to know if I could convert so small a quantity (100 horse power boiler) into potash at a profit and if the method be complicated or expensive. I know in the old times they made lye by putting the ashes in a hopper arranged over a barrel, pouring water on the ashes, which drained the lye into the barrel. A. A solution of lye is made substantially as you describe. By boiling down to dryness, crude carbonate of potash is obtained, called potash. This should find a market with soap makers, dealers in or manufacturers of chemicals, etc. The concentrated lye sold we believe to be caustic soda.

(961) W. R. writes: I have made a stick of carbon as directed in SCIENTIFIC AMERICAN, vol. lx., No. 20. It proves satisfactory, and I have used it in place of the platina of a Grove battery, but it does not seem to supply the same current as the platina, being only a small piece, about 4 inches long, 1 inch wide, and ¼ inch thick. The platina is 3 inches long by 1 inch wide. I would therefore be very much pleased if you would tell me through Notes and Queries how thick I should make the carbon to supply the same current as the platina in the battery mentioned. I should prefer it to be round carbon. A. You should have recarbonized your rod several times. There is scarcely room in a Grove porous cell for a large carbon. Better use a regular Bunsen cell, if you wish to use the carbon electrode. The carbon should not be less than 1 inch in diameter.

(962) A. V. B. asks (1) whether there are any known means of making the atmosphere visible. A. No. 2. If there is any way of producing an absolutely constant direct electric current, by mechanical means. A. All such currents in practice have pulsations or variations. At the sacrifice of efficiency for weight, a constant current can be obtained.

(963) C. K. asks whether a magnet will attract iron or steel in a vacuum. A. A vacuum has absolutely no effect upon magnetic attraction.

(964) J. A. W. asks what preparations are used to make combustible matter non-combustible. A. Tungstate of soda, borax, and other salts are largely used for this purpose. Various formulas are given in the books. The Techno-Chemical Receipt Book contains several.

(965) J. S. W. asks for a quick drying mucilage that will not mould, or sour in a warm room or weather. A. Dissolve 2 pounds gum arabic in 2½ quarts of water, add enough oil of cloves to perfume it slightly. This will be about ten or twenty drops.

(966) J. E. P. writes: In Cristiani's Perfumery it specifies liquid carmine for coloring extract of rose (page 240) and extract of raspberry (page 241). Can you give me a formula for liquid carmine which is to be used in coloring the above extracts? A. Soak powdered cochineal in alcohol and water, 3 parts cochineal, 40 to 50 parts alcohol, and 200 parts water. Add just enough carbonate of soda to the solution to color it. A very small quantity will suffice.

(967) H. G. asks whether there are any surface indications by which it is possible to ascertain the existence of gas, oil, or salt below the surface of land, or if not, whether the fact can be ascertained in any other way than actually sinking or boring a test well. A. Boring or sinking a well is the only certain way. The geological identification of strata may lead to a probability of the presence of one or the other, but there is no certainty in the matter.

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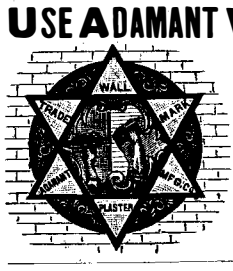

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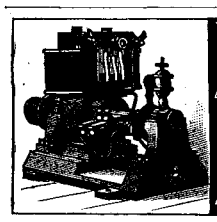

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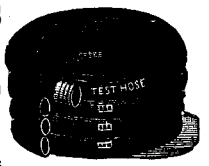

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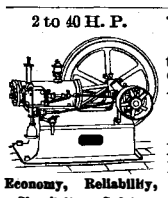

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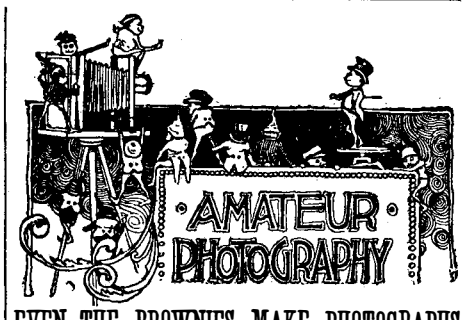

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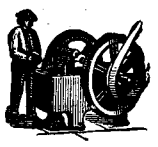

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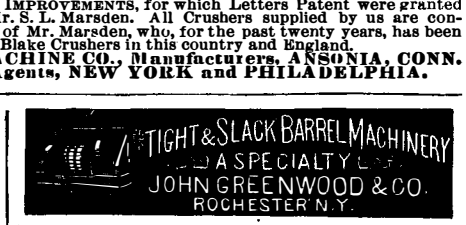

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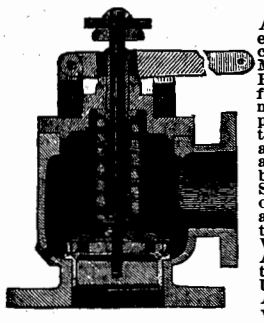

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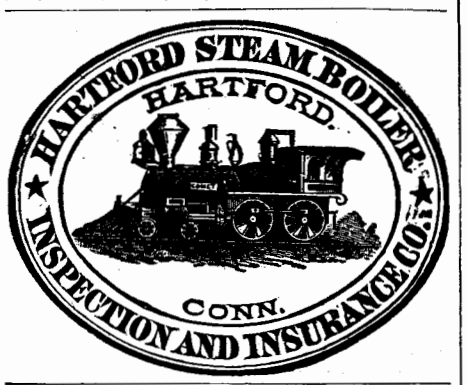

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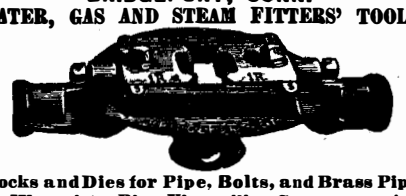

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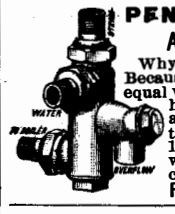

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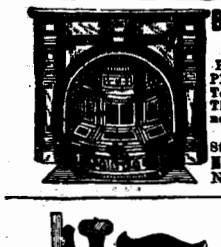

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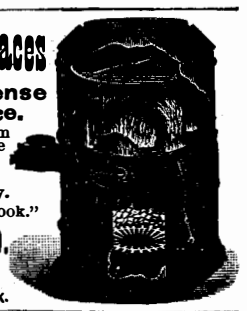

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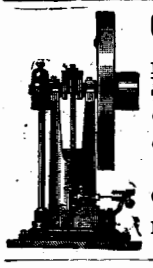

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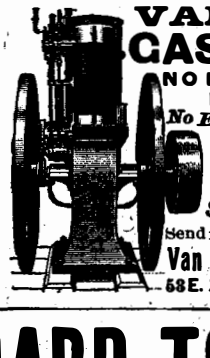

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